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EDITORIAL NOTES.

Labour Unrest and Contentment and their Effects.

WHEN a man can from personal experience look from two points of view upon a subject that is engaging universal thought, his perception is sharper and his deductions clearer than can possibly be those of a man who views from one point only through the curtailment to that point of his individual experience. Mr. Corbet Woodall, in his address to the proprietors of the Gaslight and Coke Company on Friday, viewed the conditions of the labour world to-day from two standpoints. The past half year has witnessed the protracted coal strike, more severe in its protraction because the country is more dependent to-day than ever it was upon the continuity of its coal supply; the past half year has also witnessed the strike of thousands upon thousands of men whose labour is directed to the commercial and industrial ends served by London's great waterway. As the Governor of the Gaslight and Coke Company, with its immense requirement of coal, and with its dependence for part of its prosperity upon the uninterrupted maintenance of the highest commercial and industrial interests of the Metropolis, Mr. Woodall has been deeply concerned (with his colleagues) in these two events. There we have one point of view. The Governor also came before the proprietors fresh with the lessons within him of the celebrations of the centenary of the Company; and one lesson that has impressed itself deeper than ever upon his receptive and observant mind is that the Company have found the ways and the means of knitting stronger and stronger the bonds of concord, of good-fellowship, and of a living mutual interest between all ranks of the workers in the Company—from Board-room to the men performing the lowliest of service. Our columns have recorded the events of the centenary celebrations, and our impartial impressions of the new spirit that has been fostered, and is rooting deeper and flourishing more luxuriantly day by day. The pictures presented by the half year within and outside the Company are perfectly uncompanionable and inharmonious; but the Company have felt the effects of the diametrically opposed conditions. The bad side of the effects is shown by the dip into the general purposes fund to pay expenses of coal over and above what the quantity consumed should have cost, also by the anxieties, and by the hard abnormal work of the six months. The good side of the effects is seen in the wholehearted loyal work of staff and men that reduced the bad effects to the minimum quantity and lightened their incidence, and so gave the Company accounts that, in working results and financial stability (taking into the reckoning the price of gas to-day compared with the past), have never been exceeded.

Is it to be wondered at that, under such circumstances, the comments of the Governor on the conditions in the outer labour world were the trenchant ones of the individual whose convictions have been formed from a large dual experience? He deplores the methods of modern labour warfare that cause national loss and infinite misery and distress; and when he sees that after it all the first rational course has to be the last inevitable course—conference and arbitration—and that the terms of ultimate settlement are small in comparison with the other results of the war, in his as in others' eyes "Folly" is writ in large characters over the whole of these methods. But we have one salient lesson from the new modes of warfare adopted by the labour leaders—revolutionary leaders they are, and their modes comprising the national strike and injury and belittlement of national interests (national strikes intended to gain for a section of the community benefits comparatively small by producing voluminous national loss and sorrow); and that lesson is that these modes do not ensure the success desired. That is valuable knowledge so far as it goes; but the knowledge carries no assurance as to whether the lessons gained therefrom by the labour leaders themselves will not incite them to attempt still more drastic moves. "Strikes," says the Governor, "are a huge and a stupid blunder." This all thinking and intelligent men endorse, as likewise the statement that of the price that has to be paid for it the public has to bear the lion's share. Condemnation of it all cannot be couched in too strong language.

The Governor, however, is encouraged by current signs to hope that the "dark night of strife and distress is yielding place to a morning of reason, mutual consideration, and goodwill." All earnestly hope that the signs have been read by him correctly. We are not pessimists. But examining the signs, while they may contain the seed of hope, past experience weakens reliance upon their development. Labour may have lost for the time the confidence in its revolutionary leaders that it once possessed; but past experience has taught us that, unless the men have interests that detach them from these leaders, the leaders will again catch their ears and guide their wills. The Government, too, have fresh proposals that it is hoped will put an end to the use of the strike as a weapon to settle grievances and claims. The past twelve months have seen the failure at every turn of the newer labour legislation and the newer schemes for the settlement of strikes. Experience teaches us, therefore, not to place too much reliance upon untried plans. Labour leaders, but not labour leaders of virulent speech and action, may have pronounced against the down-tools policy; these unfortunately are not the only leaders of labour. We must have more solid evidence upon which to build our hopes of a brighter future in this regard.

The Governor points to the path to more certain conditions furnished by the sliding-scale, under which there is a mutuality of interest on the part of all contributors to the prosperity of the part of the industry that comes under the beneficent influence of that important factor in the control of the gas business. It paved the way for co-partnership. Thereon is built the state of affection and loyalty that the army of men of this and other Companies (before and since its application to this Company) have consistently evinced. Upon it is founded all that has so strongly and indelibly impressed the Governor in his recent meetings, through the centenary of the Company, with both staff and men. The Governor tells his belief of momentous changes in front of the gas industry; but, though there is this belief, he sees no reason why the progress recorded in the past should not be continued to the further prosperity of the Company, with all other participants in the fortunes of the industry. We are among those who sincerely hope that one of the momentous changes will be the application of co-partnership (with all it connotes and fosters) to the gas industry generally, and to industry at large.

There has already been comment upon the accounts of the Company for the half year. A sentence or two more will suffice with reference to the position of coal prices, which have relation to the strike in the past half year. The Company, the Governor announced, have made their new contracts at prices grievously in excess of those just expired, and steamship freights are also higher (the Company, by the way, are about to launch a large steamship of their own); and together the increases will cost the Company about £270,000 for the twelve months to June next. This is a big sum. Fortunately, the Company have accumulated good reserves; but the people of London must be told this, that so large an increase causes the Directors to, this year, withhold any further reduction in the price of gas, and the blame for this must be placed on other shoulders than those of the Board. The coalowners were told by the Governor in plain language that theirs was a mistaken policy to insist upon the uttermost penny that temporary circumstances render it possible for them to demand. His words in this connection may fall on rocky ground; but the truth that the present policy will contribute to a reaction unbeneficial to the coalowners is clear through the reasoning that prompted its utterance. But for this heavier cost for coal, the horizon

of the gas industry looks quite clear. Not even the National Insurance Act (to which the Governor alluded) moves him to much concern. Therefore, the open way is seen by Mr. Woodall to an enhanced prosperity for the gas industry; and in this condition the gas industry universally rejoices.

The New Era in South Suburbia and Beyond.

THE last report of the South Suburban Company has been issued, and the Chairman (Mr. Charles Hunt) has said his last word to the proprietors, preceding the time when there will be, as it were, a parting of the ways for this Company particularly and for the gas industry generally. The words apply equally to the Wandsworth, Wimbledon, and Epsom District Company; but the meeting of the proprietors of the South Suburban Company having been held, our interest is for the moment concentrated in that direction. The last report of the South Suburban Company, we say, has been issued—that is, of the Company as a separate entity. Before the next one is prepared, before the Chairman has another opportunity of addressing the proprietors, there will have come under the one administration the large areas that to-day are the possessions of the Bromley and Crays and the West Kent Gas Companies. Before these events, too, the Company will (with the Wandsworth Company) have opened up a new chapter in British gas supply, in which will be written the commencement of the history of the industry with calorific value as the standard quality of its prime commodity, and, where this standard obtains, with the illuminating power standard a matter pertaining only to history already made. The fresh era that is breaking for the Company through amalgamation, through increased responsibilities and opportunities, and through the change in the standard of quality, does so under the best possible auspices. The South Suburban Company were never in stronger case than to-day—so strong, indeed, that they can afford to give their consumers another penny reduction, making the price 2s. 3d., which is only 1d. more than that of their large neighbours. The accounts and the speech of the Chairman, too, show that the Engineer (Mr. S. Y. Shoubridge) and his staff and men have again produced excellent working results during the half year—both in the carbonizing department and in connection with residual products—notable among the latter being the yield of 27 lbs. of sulphate of ammonia per ton of coal, together with an increase in the production of tar.

The foremost point in the address of the Chairman to the proprietors, however, was the national calamity that the past half year witnessed in the matter of the coal strike—a calamity that reminds of the fable of the mountain in labour and the production of a mouse. Mr. Hunt asks what has been the result to the miners of the great and deplorable upheaval of, and injury to, the country's interests? The answer is nothing but the inglorious Minimum Wage Act, and the position of the miners not a whit improved upon what it was prior to the strike, using the minimum wage decisions of the Joint District Boards as a criterion for judgment. The result in truth is not so much a matter for regret as the violent and tortious methods by which it was realized. Mr. Hunt pauses to look at the practical lessons of the strike. While the experience has amply proved, in the words of a labour leader, that the community has a great reserve of resisting power, while the experience has proved that the gas industry can marshal its forces so as to be equal to the severity of the conditions arising from complete separation from its main sources of supply, there is a movement in the world of organized labour (of which the coal strike, the last railway strike, and the more recent attempt to again bring about a national strike of transport workers are material evidences) that no administrator in any industry can afford to neglect. What was the experience of the South Suburban Gas Company? The Chairman tells us that for nine weeks scarcely a ton of coal passed along the works' sidings. That was serious enough; but there was supplementary reason for concern, in that for at least an equal period the deliveries were much less than the contract quantities. Fortunately, the end of the strike did not find the Company at the end of their resources. The miners—their leaders perhaps more than the miners themselves—had hoped to gain their ends by the crippling of the country. There can, however, be little doubt to-day that the feeling of the miners—the majority of them are not bad sportsmen—is reflected in the words, tinged by admiration, of the labour leader who used them: "The community has "a great reserve of resisting power." A review of the strike—its causes, effects, and lessons—brings the gas administrator to the firm resolve that, so far as he is concerned, the reserve of resisting power shall not be allowed to grow less in face of the standing menace of the new combinations of trade unions. That is the rendering we put upon similar words in Mr. Hunt's speech. It is the duty of gas administrators (the great strike shows that, in the majority of cases, they were mindful of it) to keep well abreast of new conditions that threaten to assail the efficient discharge of duty and fulfilment of responsibility.

Chemical Clause—Parliamentary Inquiry to be Held.

THE part of Mr. Hunt's speech at the South Suburban meeting (referred to in the preceding article) which has the largest immediate interest is that in which he dealt, in terms that the subject warranted, with the intolerable position in which the gas industry has been placed—we hope only temporarily—through the unjust application of a limitation to its residuals business, which is entirely subservient to the gas business, and the profitable conduct of which conduces to the cheapest supply of gas in the public interests. On the 16th ult., an article was published in the "JOURNAL" in which it was suggested that the infliction of the injustice had reached such a stage—without the industry as an industry having had any opportunity whatever of putting its case fully before any competent tribunal, without the industry as an industry having had an opportunity of showing the evil of restricting purchasing and selling markets for raw liquid residual products and spent oxide—that a public or parliamentary inquiry was necessary. Mr. Hunt has been the first to make publicly known, through his address to the South Suburban proprietors, that a parliamentary inquiry into the matter has been granted, and that it will be held early next year. For this the gas industry will be thankful to the parliamentary authorities; and for the inquiry, they may be assured, evidence will be in readiness to show complete justification, in the interests of this public-serving industry and of the public, for the maintenance of open residuals markets, and evidence as to the want of justification on the side of the chemical manufacturers for preferential consideration and protection in these markets. All we hope is that the tribunal will be one that, through its constitution, will be fully competent to consider the matter, and to consider it in an impartial and judicial spirit.

As has been said before in these columns, the chemical manufacturers are fully capable of taking care of themselves in free competition, although by their action they profess otherwise. But the garments of tradesmen oppressed by a wealthy competing corporation with which they attempted to disguise themselves when approaching the parliamentary authorities in their manacling crusade, did not sit well upon them. Mr. Hunt tore the disguise to shreds when, in a scathing sentence, he remarked upon the plea being puerile to the extreme as to competition being unfair between gas undertakings (who are able to raise money by statutory authority) and, say, Brunner, Mond, and Co., who are paying regularly something like 30 to 35 per cent. on a capital largely created out of revenue. This alone is a complete and substantial answer to preferential conditions being possessed by the gas industry, and to the claim for preferential protection for the free-trading and self-seeking chemical industry to the detriment of gas industry and public alike. All the gas industry asks is complete liberty for itself in the matter of the residuals business, without any desire to take from the chemical manufacturers any part of the complete liberty that they possess, and moreover without any desire to roam generally into the fields of chemical production. "Our concern is "with regard to the future." Let that be recognized; let it be recognized that the insidious ultimate intention of the chemical clause is the complete inrailing of the markets for the purchase and sale of raw residual products, thus preserving them for, and placing them under the unfettered control of, private chemical manufacturers, whose operations are solely in their own private interests, and whose operations are not exposed to the world as are those of a statutorily controlled semi-public service. It is to be hoped that many chairmen of gas companies will publicly express, at the meetings within the next few weeks, their resentment over what has been done in Parliament in connection with the chemical clause during the present session; and from many

quarters we hope there will come the fullest support in the nature of evidence for those who will lead on behalf of the gas industry in the parliamentary inquiry a few months hence. It is a condition of affairs that the gas industry cannot afford to allow to rest until it secures the justice that, in this matter, is only to be found in competitive freedom for gas industry, coke-oven owners, and chemical manufacturers alike.

The formal step in bringing about the inquiry to which Mr. Hunt referred was taken in the House towards the end of last week, when the Right Hon. J. H. Whitley, the Chairman of Ways and Means, placed on the paper of the House of Commons a notice of motion declaring the expediency that a Joint Committee of Lords and Commons should be appointed to consider and report whether any, and, if any, what restrictions should be imposed on gas authorities with respect to the purchase and manufacture of residual products resulting from the manufacture of gas by other gas authorities, or of other chemicals. The motion also proposed that the resolution should be communicated to the Lords, with a desire for their concurrence. Regarding the attitude of the House of Lords, there is no doubt whatever as to their concurrence, seeing that the authorities of both Houses have acceded to the representations put before them. Out of evil sometimes comes good. Probably if it had not been for the decision given on the Swansea and West Kent Orders by a Lords Committee, no one would have thought of asking for a Joint Committee. It remains for the gas industry to make the most of their opportunity. At the time of going to press, we learn that the motion (which was introduced in the House of Commons yesterday) was agreed to after a short conversation.

The Load Factor in Gas Supply.

A STUDENT of the affairs of the gas industry (the results of whose thought and investigations we are always pleased to receive) has been endeavouring to ascertain what lessons are to be extracted from the application to gas supply of the test of the "load factor," which is, as he states, of fundamental importance to the electrical industry, owing to generating stations having no practical means of storage. As he remarks in an article in this issue, the higher the load factor, the lower become the standing charges of an electricity undertaking per unit supplied; and thus is at once seen why the load factor was at one time regarded in the electrical industry as a guiding principle, owing to the effect upon the total cost of supply, in the fixing of differential charges for the energy consumed for different purposes. This guiding principle, however, is now, as the tariffs of most electricity undertakings conclusively show, as much honoured in its breach as in its observance. But in gas supply, owing to the conditions of demand, and the ability of the gas engineer to meet temporary and considerable fluctuations of demand through the facility afforded by large storage (which the electrical engineer does not possess on a scale of any substantial importance), the application of the load factor has no really valuable significance, excepting in so far as it supplies a test by which can be ascertained which are the lines of business the cultivation of which will conduce to an improvement of the load factor. But having ascertained this, as our contributor has done, we are brought up against the truth that beyond the interest attaching to the exercise, the gas engineer is helpless. And under his peculiarly favourable conditions, there need be nothing but gratitude over the fact. He may ascertain the best lines for improving his load factor, and he may propose to pursue them; but while he is proposing, the public through its demands disposes.

The fact of the uselessness in gas supply of the application of the load factor in the way the electrical engineer applies it is particularly indicated by the calculations made by our contributor. It is instructive to find that the examples show the gas undertakings named and the one unnamed have each a load factor more than twice that of which the best working in the electrical industry can boast. But take the calculations made in connection with the unnamed undertaking over a series of years that carries us back almost to the genesis of the concern; and there we find that the load factor has not varied greatly. The business of this concern, however, has increased luxuriantly in that period, gas is sold, and has been for many years, at a low price, dividends are of the best, and the undertaking has been maintained in a high state of efficiency. The fact that the load factor has only varied slightly in this instance has had no material effect in retarding these progressively gratifying conditions. Take, again, the application of the load factor to capital. We should find it difficult indeed to derive any beneficial and helpful lessons from this, owing to the heavy capital expenditure in the distribution department through which profit-yielding business has been piled up, and owing to the expenditure of capital upon the production of economies that make their impression upon the expenditure side of the revenue account per unit of gas output. It is quite conceivable in certain cases that, instead of a higher load factor to-day, compared with a period ago, showing reduced standing charges per unit of production, those standing charges may be higher, and yet the financial condition of the concern may be considerably more stable than in the period when the standing charges were lower in relation to the load factor. This question of the load factor has previously been a matter of interest to us; but we have never yet found any practical value in it however applied to gas-supplying conditions. We read the confirmatory opinion in the statement of our contributor, when he writes that "it is "not intended by these notes to establish any exaggerated "significance for the load factor in gas supply"—indeed, "the influence on gas administration is a very slight one." At the same time, it cannot be gainsaid that, if we adopt the simple process of taking the number of cubic feet sold per annum, divide it by 365, the nearer the relation of the daily average thus obtained to the maximum daily delivery, the higher is the load factor of the undertaking, and the better is its position.

There are several other lessons in the article that will command the thoughtful consideration of readers, and we hope will lead to discussion by those interested. One thing that is illustrated is this, that the electrical industry can never, under its existing conditions, hope to supplant the gas industry in meeting the fluctuating demands made upon the latter. Take, for instance, the cooking load. Our contributor finds it beyond his power of conception to name the size of an electricity generating plant that would be required to furnish a supply equal to that of a flourishing gas undertaking between the hours of 11 and 1 upon a Sunday morning. Add to the requirements of a mammoth generating plant to meet this short duration heavy load, the charge per unit of ½d. or 1d. for cooking purposes, and perhaps some electrician will tell us how far these prices would find justification upon the basis of the relation of this particular load to standing and running charges. The whole topic is interesting, if of no great practical utility to the gas engineer—under the circumstance of the facility he has for economically meeting heavy erratic demands. His entire conditions are opposed to those of the electrical industry; and for this fact he is profoundly thankful.

Municipal Trading in Electric Fittings.

THE municipal section of the electricity supply industry has just received another ugly shock, through the rejection by a Committee of the House of Lords of the clause in the Sheffield Corporation Bill which was intended to regularize and legalize the trading in electric wiring and fittings in which the Corporation have been indulging since they acquired the electricity undertaking some fourteen years ago —the wiring and fitting business being regarded by them as part of the concern that their purchase powers enabled them to take over. The business has multiplied many times; and the Corporation have enlarged the activities and methods of the branch, to the material disadvantage, it is said, of the local electrical contractors. On all grounds of consideration, moral and politic, the local contractors have contended that the Corporation have no right to possess such competitive powers, and, as a matter of fact, had no such powers. The Corporation were disinclined to yield up the business they possessed. But when they were compelled to submit to a judicial determination as to their right to carry on the business, then they showed the weakness of their belief in their legal position by simultaneously inserting a clause in an Omnibus Bill this session to give them the power that they claim to already possess. We are not sure, as matters have gone, that this has not undermined the position of the Corporation in prosecuting their appeal against a decision secured by the contractors from Mr. Justice Swinfen Eady, who declared the Corporation (as Mr. Justice Neville had previously declared was also the

position in the Leicester Corporation case) were, under the existing statutes, acting *ultra vires*. However, the matter stands thus: Mr. Justice Swinfen Eady said the Corporation have no power to carry on this wiring and fittings business; and the Corporation have entered an appeal. Meanwhile, the Bill of this session contains a clause to empower the Corporation to trade in these directions. The clause was, under the special circumstances of the case, allowed by a House of Commons Committee; but it has been rejected by a Committee of the House of Lords, who, however, have given the Corporation the Model Clause, which will permit them to carry on the business, but conditionally on the work being done through a contractor. Before the case reached the House of Lords, the contractors offered to accept the Model Clause. The fight has therefore not only been abortive, but wasteful.

Now the question arises as to whether the Corporation can gain anything by proceeding to the Court of Appeal. Supposing they were successful there in upsetting the judgment of Mr. Justice Swinfen Eady, of what profit would it be to them, seeing that the clause that will stand in their Act of 1912 will decree that all such work must be done by them through local contractors? This would override any right that appeal might determine existed under previous Acts. The Corporation had better accept the inevitable, instead of wasting more of the ratepayers' money over trying (what looks much like a hopeless task) to prove they were right under the old order of things, while the House of Lords has established a new order of things for them in this relation. The decision of the House of Lords simply means that, even if the Corporation possessed the plenary powers in this matter that they claimed, they ought not to have been allowed them. This is not a new attitude on the part of the House of Lords. The House has fairly consistently set its face against trading by municipalities in electric wiring and fittings; and the fresh evidence of this will not be looked upon with the glad eye by the promoters of the General Electric Wiring, Hiring, and Finance Bill which has been launched on behalf of municipal electricity supplying authorities, but which has been shelved for this session. The decision, on the other hand, has substantially strengthened the position of the electrical contractors; and the first to keenly appreciate this will be the Municipal Electrical Association. In view of the circumstances of a fourteen years' unfettered trading, whether or not the Corporation have been acting *ultra vires*, the decision of the House of Lords Committee is a heavy blow against the direct trading by municipal authorities in electric wiring and fittings.

During the Sheffield proceedings, there was an attempt to set up the old and much strained analogy between Corporation Gas Departments who supply gas-fittings and Corporation Electricity Departments. This point has often been discussed. Experience has drawn a wide distinction between the two. Private gas-fitters did not originally take up the piping of houses and the supply of fittings in the same manner that the private electrical contractors are prepared to do; so that there was no choice but for municipal gas departments to undertake the work. Then there is a great distinction between gas and electricity supply, in that experience has shown that the electrical wiring and fittings business is, unless in a highly favoured city or town, extremely speculative, while the contrary throughout the country has been proved in relation to gas fittings and appliances. One reason for this is that though gas appliances are relatively cheap, their lives are long, and the charges for repair and depreciation are relatively small. The converse is the case with electrical appliances. Though their cost is high, their lives are comparatively short, and the expenses of repair and depreciation are comparatively great. There is, on grounds of fact and experience, more reason for safeguarding the ratepayers in connection with trading in electricity fittings than in connection with those for gas supply. But our electrical friends will no doubt rejoice to learn that, in the case of certain municipal authorities who have lately taken over the local gas supplies, the new model clause referring to fittings has been applied to them; and this stipulates the intervention of local contractors.

Austrian Gas-Works Practice.

THE position that gas supply has attained among the world's utilities and conveniences, and in the world's work, is constantly being shown by the additional outlay that is made on large works for meeting the demand. This is especially emphasized in the case of the capital cities of the Continent. We see it in Paris, Berlin, Vienna, Brussels. In Paris a gas-works scheme is now being carried out representing many millions of francs. So firm, too, is the belief of the Vienna City Council in the future of gas supply that, as the privately held gas-supply concessions have fallen in, they have taken upon themselves the responsibility of supply, and have constructed extensive works for the purpose. The increased demand and the enlarged gas-supply territory of which the Municipality have entered into possession, have necessitated the construction of the first section of a second gas-works, on a site comprising 110 acres; and these works are described in other columns this week. It will be seen that they have been designed to the highest point in modern mechanical equipment; comprising, among other things, electrically-driven coal and coke handling plant of the most modern form. When it is observed—and this is a cardinal feature of the new works upon which much of the general design depends—that chamber settings have been adopted with 11-ton charges and 7½-ton discharges, which are dealt with in bulk, it will be obvious the mechanical plant has had to be specially designed of a character to meet such heavy work, and this must mean a cost in excess of plant to handle smaller weights. There is an interesting feature about heating these carbonizing chambers. In the realms of gas-manufacturing practice, a good deal of attention at intervals has been turned to the subject of heat economy in carbonization, and to the saving of fuel. In the case of the chamber settings, central producers are employed; but under the carbonizing chambers are some spaces packed with firebrick chequer work. These spaces are called heat-economizers; and their title to this distinction arises from the fact that the flue gases are, by their help, utilized in raising the temperature of the producer gas and the air. "This utilization of the heat of the flue gases" is said "to greatly diminish the consumption of producer gas, and "consequently of coke for heating. The fuel consumption "for heating the chambers is thus smaller than with other "settings." We should like to see all the various figures bearing upon these interesting points.

South Metropolitan Gas Accounts.

Bank Holiday interrupting the normal course of Press work, and compelling the printing of the "JOURNAL" earlier than usual, it is impossible this week to make the customary survey of the half-year's accounts of the South Metropolitan Gas Company, which were received as the final preparations were being made for this issue. Examination of the figures will be made next week. Quite cursorily glancing at the figures, however, it is seen that both business and working have been good. Charging to the insurance fund the major part of the extraordinary expenditure occasioned by the coal strike and the disturbance in working at the pits produced by the Mines (Eight Hours) Act, the Company can pay out of the profits of the past half year their excellent dividend at the rate of £5 9s. 4d. per cent. per annum, and increase the carry-forward by £28,057. The gas yield per ton is at the high level of 12,275 cubic feet; and the increase in the consumption of gas is 2·6 per cent. It is noteworthy that 2·62 per cent. was the increase in the corresponding half of 1911; but (compared with the corresponding half of the previous year) the 2·62 per cent. of a year ago represented on the total quantity sold 165,207,000 cubic feet, while the 2·6 per cent. on this occasion represents 167,906,000 cubic feet. Reverting to the cost to the Company of the coal strike, the total was £89,000, which is a dead-loss to consumers, shareholders, and employees, and of which sum the Official Auditor has certified that £75,000 is a proper proportion to be charged against the insurance fund. The total sum may be considered a large one; but the Directors preferred to maintain the reputation of the Company throughout the strike for giving an abundant supply of gas of a quality and purity well above the parliamentary requirements. They succeeded; and the success is worth the price, though that such an amount of expenditure should have had to be incurred through outside causes is a matter over which there is natural resentment.

Treatment and Disposal of Spent Gas Liquor.

With the considerably increased production of ammoniacal liquor chiefly through bye-product coke-ovens becoming the vogue for the manufacture of metallurgical coke, a vastly enlarged

amount of spent liquor has to be disposed of; and, in consequence, those who are officially charged with the responsibility of protecting rivers and streams against pollution now keep a very critical eye upon the methods of disposal. A paper that was read last week at the Royal Sanitary Institute Congress by Dr. H. Maclean Wilson (and from which some extracts have been forwarded to us by a correspondent), purported to deal with the pollution of streams by spent ammoniacal liquor; but so far as the extracts to hand go, they contain exceedingly little evidence as to the pollution. It is not denied that such pollution exists; but the responsibilities of the producers of spent gas liquor are such that we only hope to hear of any such pollution being accidental and not deliberate in the desire to have recourse to the easiest mode of disposal. The portions of the paper to hand deal more particularly with the methods that have been devised for the treatment of spent liquor, and with the effect of new processes of ammonia recovery upon the quantity of spent liquor to be disposed of. The reduction of the latter is as important a side in the consideration of the question, as its increase is in enhancing the difficulty of its disposal. We cannot think that Dr. Gilbert Fowler will ever be able to invest his bacterial method of treatment (however great its efficiency in rendering spent liquor innocuous) with any economic stability; and up to the present Mr. J. Radcliffe's process of chemical purification of spent liquor stands as one of the most practical plans yet devised. Dr. Maclean Wilson points to the effect that the direct recovery from gas of ammonia by contact with sulphuric acid would have in reducing the quantity of ammoniacal liquor, and consequently of spent liquor for disposal. Such recovery might, judging from inquiry in connection with an installation of coke-ovens, affect the quantity of spent liquor by at least 50 per cent.; but there are many matters to be definitely settled before the old scrubber is extensively scrapped in gas-works, and direct recovery takes its place. There is still the liquor to be dealt with produced by the condensation of the moisture contained in the coal carbonized, so that the disposal and treatment of spent liquor is inseparable from our gas-manufacturing process. By one or other of the new processes, there may be various economies in connection with the production of sulphate of ammonia, but there may also be something to set against this in connection with gas supply; and relative values have not yet been fully determined.

The Residual Products Question.

Last Thursday, the Chairman of Ways and Means placed on the paper of the House of Commons a notice of his intention to submit, at the time of private business yesterday, the following motion: "That it is expedient that a Joint Committee of Lords and Commons be appointed to consider and report whether any and, if any, what, restrictions should be imposed on gas authorities with respect to the purchase and manufacture of the residual products resulting from the manufacture of gas by other gas authorities, or of other chemicals. That a message be sent to the Lords to desire their concurrence."

Forthcoming Classes.

With the sanction of the Birmingham Corporation Gas Committee, classes will be held next winter which will be definitely devoted to the requirements of those who are desirous of preparing themselves for the commercial side of the gas undertaking, and will be somewhat fuller in many respects than those usually given under the term "Gas Supply." The Birmingham Municipal Technical School authorities have also arranged special classes in "Gas Supply," to be conducted by Mr. W. G. S. Cranmer. These will be such as to prepare students for the City and Guilds examinations in the subject. The "commercial" class will be open to all clerks of the department, and also to the senior fitters. In connection with the Regent Street Polytechnic in London, Mr. Alwyne Meade, Assoc.M.Inst.C.E., of the Commercial Gas Company, has been appointed lecturer in "Gas Engineering" for the coming winter. While Mr. Meade will devote his lectures almost entirely to the purely engineering side of the subject, the chemical and analytical branch will be dealt with by the head of the Chemical Department of the Polytechnic. In addition, a special series of lectures will be delivered on "Illumination" and "Photometry," and the students will thus have exceptional opportunities, as the old fee will admit to all three sets of lectures.

An arrangement has been entered into by the Corporation of Harrogate with Professor Arthur Smithells, F.R.S., of the Leeds University, for a scientific examination of the Spa waters. The work of Professor Smithells will, it is stated, include much more than an analysis of the various Spa waters, and will, with the co-operation of his University colleagues, include a chemical, physical, and geological survey of the whole system of springs, and a scientific investigation of various points that arise in connection with their utilization.

PRESENTATION TO MR. JOSEPH TYSOE.

An interesting meeting took place on Monday afternoon last week at "Colwyn," Westcombe Park Road, Blackheath, the residence of Mr. Joseph Tysoe, who up till the 30th of June had for twenty-six years held the position of Engineer of the East Greenwich station of the South Metropolitan Gas Company, until failing health compelled him to resign. The occasion was made the opportunity by his colleagues of showing their respect for his sterling merits and long service, by the presentation to him of a silver rose-bowl and an illuminated address. It was thought that, having regard to the state of Mr. Tysoe's health, a private gathering at his residence would be more suitable than a crowded meeting; and a representative deputation, from all ranks in the Company's service, waited upon him on the day named. There were present Mr. Charles Carpenter (Chairman), who made the presentation, Mr. W. Doig Gibb (Chief Engineer), Mr. F. M'Leod (Secretary), Mr. A. F. Browne (Engineer of the Vauxhall station), Mr. Gibson, Mr. Blackmore, Mr. Field (Chief of the Tar Department), Mr. F. J. Bywater, who is succeeding Mr. Tysoe, and Mr. Charlton—Mr. J. White representing the staff, and Mr. White (Chief Foreman at East Greenwich) and Messrs. Morris and Cawte the workmen, at East Greenwich. Among those who were unable to attend, but who sent their best wishes, were Messrs. Braidwood, Franks, and Hunter (Engineers of Works), Mr. Sims (Accountant), Mr. Richbell (Chief Cashier), and Mr. Baily (Chief Engineering Clerk). Owing to the private nature of the gathering, many who would otherwise have attended were not present, but called later in the afternoon to pay their respects to Mr. Tysoe, and to wish him renewed health.

The rose-bowl, which is an excellent example of the silversmith's art, was made by Messrs. Elkington, of Regent Street; and upon a silver plate let into the plinth the following inscription was engraved:—

> Presented to Joseph Tysoe, Esqre., M.Inst.C.E., by the Officers of the South Metropolitan Gas Company and the Staff, Foremen, and Men at the East Greenwich Works, on his retirement from the position of Engineer of that Station after 26 years' service. June 30th, 1912.

Mr. Carpenter said he had great pleasure in asking Mr. Tysoe to accept this *souvenir* from the officers of the Company and the staff and men at East Greenwich, as a token of the esteem and great regard in which he was held by all of them. During the time he (Mr. Carpenter) was Engineer, and afterwards Chief Engineer, of the Company, he had, on the many occasions on which he had been at East Greenwich, witnessed the good feeling which existed between Mr. Tysoe and his men. Mr. Tysoe had been at East Greenwich practically during the whole period of the erection of these large works, the building of which had called for good qualities both of skill and endurance. He had had many opportunities of judging Mr. Tysoe's sterling worth as a man, and had great admiration for his sturdy independence of character and thought. It was difficult for him to express how sorry they all felt that Mr. Tysoe's career had been curtailed by ill-health; and he hoped that his retirement and release from the cares of business would bring him better health, and that he would live long to enjoy the rest which the Board of Directors had tried to make as comfortable as possible. He had much pleasure in handing Mr. Tysoe the rose-bowl.

Mr. Tysoe, in acknowledging the gift, said: At a time such as this, which marks the breaking-up of old associations of upwards of a quarter-of-a-century, one cannot altogether control one's emotional feelings; and I desire, in the first place, to thank you, one and all, for the kindly thought which prompted your action in desiring to spare me the ordeal of appearing before a large audience in a more public place. It is especially gratifying to me, Sir, that you, the Chairman of this great Company, should honour me by taking the part you have done in this day's function; and it adds one more to the many acts of kindness and consideration for which I am indebted to you, and which I shall carry with me in my retirement as pleasant memories of the past. And now I have to thank you, gentlemen, and all those whom you represent, for the very handsome *souvenir* which is the expression of your good-will towards me, and to say that I accept it with intense pride and pleasure. The sense of this good-will and kindness will be present to me every time I look upon it. I am pleased to think I have so many friends among you all, and hope I have made no enemies. But, in this connection, perhaps you will allow me to quote the words of the late Charles Mackay, which I was reading the other day. He says:—

> You have no enemies, you say.
> Alas, my friend, the boast is poor.
> He who has mingled in the fray
> Of duty that the brave endure
> Must have made foes. If you have none,
> Small is the work that you have done.
> You've hit no traitors on the hip,
> You've dashed no cup from perjured lip,
> You've never turned the wrong to right,
> You've been a coward in the fight.

But, in spite of Dr. Mackay, I prefer to hope that I have made no enemies, and that, if any action of mine caused ill-feeling, it was only temporary. I am afraid my words this afternoon have been but a poor and inadequate translation of my feelings; but I ask your indulgence. I can assure you that this break of official

relations with you is a source of genuine sorrow to me, tempered though it is by your kindly action in presenting me with this lovely rose-bowl, for which I again thank you from the bottom of my heart. In conclusion, allow me to utter the fervent wish that you may all be spared to render long and honourable service to the Company with which I am proud to know that I have been so long associated.

Mr. Doig Gibb said Mr. Tysoe's resignation was deeply regretted by everyone; and he was sure he was voicing the opinion of the engineering staff when he expressed the hope that Mr. Tysoe would live a long time to enjoy his honourable retirement.

Mr. Field said he spoke not only as a colleague of Mr. Tysoe but as a friend of very long standing. His respect for him as a man had always been very great; and he wished him increased health and happiness.

The other speakers who joined in wishing Mr. Tysoe renewed health in his retirement were Mr. A. F. Browne, Mr. Bywater, Mr. J. White, for the East Greenwich staff, and Messrs. Cawte and Morris for the employees.

A Committee of the workmen subsequently called on Mr. Tysoe; and, on their behalf, Mr. Tye expressed the deep regret of the whole of the men at East Greenwich at Mr. Tysoe's retirement, and their best wishes for his future.

All the visitors were hospitably entertained by Mr. and Mrs. Tysoe, assisted by Miss Tysoe.

PERSONAL.

Mr. Robert S. Gardiner has resigned his seat on the Board of the Continental Union Gas Company, Limited.

Mr. George Dixon, of the Widnes Corporation Gas and Water Department, has been selected for the position of Technical Assistant to the Wallasey Corporation Gas and Water Department, as advertised in the "Journal" for the 25th ult.

"It is," says the "City of Birmingham Gas Department Magazine," "with feelings of deep regret that we have to record the coming departure from our midst—about the middle of September—of Mr. Wilfrid Wastell, our popular Deputy-Secretary, who has been appointed Secretary to the South Suburban Gas Company."

In connection with the Birmingham Corporation Gas Department, it is notified that Mr. C. M. Walter, B.Sc. (Eng.), has been appointed Superintendent of the High-Pressure Laboratories, under the Chief Chemist (Mr. E. W. Smith, M.Sc.). Mr. H. H. Billingsley, of the Central Laboratory, has been transferred to the High-Pressure Laboratory; and Mr. P. C. Balcon has been appointed Chief Assistant at the Central Laboratory. Mr. H. C. Smith, late Works Chemist at Adderley Street, has been appointed Superintendent at Swan Village.

Mr. Charles M'Pherson, until recently the head foreman at the Nechells Gas-Works of the Birmingham Corporation Gas Department, has taken up the duties of his new position as Engineer and Managar of the Clay Cross Gas-Works, near Chesterfield, in succession to Mr. John S. Lucking, whose appointment as Assistant-Manager at the Calcutta Gas-Works was recently announced in the "Journal." Mr. M'Pherson, who was educated at Robert Gordon's College, Aberdeen, served five years as an articled engineering pupil with Messrs. Blaikie Bros., engineers, Aberdeen, and afterwards for seven years was junior assistant in the Aberdeen Corporation Gas Department. From there he came to Birmingham as foreman fitter at the Nechells works, and afterwards succeeded Mr. William Angus as head foreman at that station, on the latter's appointment as Engineer to the Buenos Ayres New Gas Company. At a farewell gathering at the Nechells works on the 14th ult., Mr. M'Pherson was the recipient of a handsome clock subscribed for by the foremen and staff at the works; the presentation being made by the Engineer, Dr. W. B. Davidson. To succeed Mr. M'Pherson as head foreman at Nechells, the Birmingham Gas Committee have appointed Mr. Harold E. Stone until recently one of the senior chemists of the department. Mr. Stone is quite a "home product." Receiving his education at the Birmingham Municipal Technical Schools, he entered the service of the Gas Department as a junior chemist under Dr. Davidson in 1906, and has had a progressive career since then. In the course of his duties, he has had charge of the cyanogen plants installed at the works of the department. He holds a first-class Honours certificate from the City and Guilds of London Institute, and last year read a paper before the Midland Junior Gas Association on "Purification."

Bonecourt Surface Combustion, Limited.—A Company has been registered under this title, with a capital of £250,000, in £1 shares, to acquire certain patents and rights relating to improvements in burning gas fuel, to adopt an agreement with Radiant Heating, Limited, and Combustion Improvements, Limited, and to carry on the business of makers of, and dealers in, plant for working these inventions. Minimum cash subscription, 20,000 shares. The first Directors are the Earl of Denbigh, H. Edmunds, G. le M. Mander, H. W. F. Garland, and P. St. G. Kirke. The Company has been formed for exploiting the patents of Professor Bone and Mr. C. D. M'Court, now the property of Radiant Heating, Limited. The Secretary of the Company is Mr. Roy Sanderson; and the offices are at Parliament Mansions, Victoria Street, Westminster, S.W.

OBITUARY.

The death occurred recently of Mr. Henry Howard Batten, one of the Directors of the Brentford Gas Company. Deceased was the son of the Rev. Henry Batten, of Penzance, and was formerly Clerk of the City Parochial Foundation.

The death took place on Sunday, the 28th ult., at his residence in Edinburgh, of Mr. Thomas Temple Mackie Lumsden, Managing-Director of the firm of Messrs. James Milne and Son, Limited. Mr. Lumsden was 62 years of age and was a native of Edinburgh. He joined the firm twenty-four years ago; and for nearly eighteen years he occupied the position he held at the time of his death. He did not play a very prominent part in Edinburgh public life.

A prominent citizen of Liverpool was removed by death last Wednesday, in the person of Mr. W. Wilson Walker. The deceased entered the City Council in 1898, but retired last year on account of illness. While a member of the Corporation, he was chiefly active in connection with the street lighting department, over which he presided as Chairman of the Lighting Sub-Committee. He was largely instrumental in persuading the Council to establish gas-works at Fazakerley; and he performed the formal opening of these works, which were described in the "Journal" for Oct. 26, 1909.

The "South Metropolitan Co-Partnership Journal" reports the death as having occurred on the 15th ult., at a nursing home in Balham, of Mr. Alfred Holte, for many years Cashier to the Company. Mr. Holte was staying for a short time at St. Albans (following his favourite pastime of fishing), when he was suddenly taken seriously ill and was removed to Balham. Born in 1844, he entered the service of the Company in 1861, and retired on a pension in September, 1904. In the early days of his service with the Company, Mr. Holte was engaged for a time in the office of Mr. Thomas Livesey, of whom he always expressed himself as having the kindliest recollections. By his decease, another of the few remaining officers who saw service at the old offices is removed; and his death will be much felt, particularly by those who were contemporary with him.

CITY AND GUILDS EXAMINATIONS.

The Prize Winners at the Last Examinations.

In the "Journal" for the 18th of June (p. 890), the list was given of the candidates who passed the last examinations in "Gas Engineering" and "Gas Supply" in the Department of Technology at the City and Guilds of London Institute. We have now received from the Superintendent of the Department (Sir Philip Magnus, M.P.) a list of the prize winners in the subjects named, as well as in those of "Coal-Tar Distillation and Products" and "Heating and Ventilation." The following are their names, and the centres at which they studied.

Gas Engineering.

Final.—First prize (£3 and a silver medal), George Gerard Wilson, Birmingham Municipal Technical School.

Grade I.—First prize (£2 and a bronze medal), Henry Gage, Cardiff Technical School; second prize (£1 10s. and a bronze medal), Percival Joseph Channon, Brighton Municipal Technical College; third prize (a bronze medal), Edward Frank Joiner, London.

Gas Supply.

Final.—First prize (£3 and a silver medal), George William Wortley, Enfield Technical School.

Grade I.—First prize (£2 and a brone medal), Percy Pickering, Croydon Central Polytechnic; second prize (£1 10s. and a bronze medal), William Brown, London County Council School; third prize (a bronze medal), Alfred George Peters, Brighton Municipal Technical College.

Coal-Tar Distillation.

Final.—First prize (£2 and a silver medal), William Stanger Bryan, East Ham Technical College.

Grade I.—First prize (£1 10s. and a bronze medal), Albert Freeborn, East Ham Technical College.

Coal-Tar Colouring Matters.

Final.—First prize (£2 and a silver medal), Victor Hobson Goldthorpe, Huddersfield Technical College.

Grade I.—First prize (£1 10s. and a bronze medal), William Johnson, Leeds University.

Heating and Ventilation.

Final.—First prize (£3 and a silver medal), Harold Wallace, London County Council School.

Grade I.—Second prize (£1 10s. and a bronze medal), Henry L. Jenkins, Merthyr Tydfil County School; third prize (£1 and a bronze medal), Harry Underhill Diplock, London County Council School.

The money prizes in "Gas Engineering" and "Gas Supply" are given by the Goldsmiths' Company; those in "Coal-Tar Distillation and Products," by the Salters' Company; those in "Heating and Ventilation," by the Institution of Heating and Ventilating Engineers. The medals are given by the Institute.

ELECTRICITY SUPPLY MEMORANDA.

Coal Strike and Expansion—Increased Cost for Appliances—One Reason for Reduced Tariffs—Loans and Repayment Periods—Disuniform Bases of Calculation—Ratepayers or Consumers—A Preferential Charge—No Bonus.

THE accounts of municipal electric-supply undertakings for the year ending March last are now being reviewed week by week in the electrical press; and fairly frequently we come across the statement that the expenses of the year increased owing to the coal strike. The coal strike ended early in April; so that next year's accounts will also have upon them the further marks of the coal strike, and will incorporate over a period the additional price that the coalowners are trying to extract from the buyers of coal for industrial purposes owing to the Minimum Wage Act. The last has not been heard of the increased costs of coal to electricity undertakings any more than they have been in the case of gas undertakings. The electricity supply undertakings were applauded roundly by an elated electrical press at the close of the strike for their foresight in laying up so much coal treasure in their stores before the rupture in supply started. But these oft-recurring notices of higher costs for coal show the scramble there was for coal among the managers of electricity concerns when the strike began and prices had risen. *Exempli gratia;* West Ham had to incur an additional "special extra charge" for coal of £2500 last year; and higher rates of wages, as well as special breakdowns [why "special?"], raised the cost of labour by £1000. Marylebone paid £1000 more for coal; and Keighley found that two national strikes and the hot summer (which caused a scarcity of water) cost the department £500 more in increased working expenses. In a few places, there is a claim that the coal strike brought benefit to the electrical undertakings—in fact, the joy bells were vigorously rung at the end of the strike by our electrical journalistic contemporaries. Up to the present, however, we have not come across anything of abnormal appearance in the published accounts. As a matter of fact, in residential areas the cry is that, owing to increasing expenses through taxation and higher prices, people are showing an unwillingness to incur outlay in making changes. Gas undertakings mostly did well during the period of the coal strike in fixing new gas-cookers, and in supplying power and other appliances for industrial purposes. These electricity concerns that show good increases trace them unmistakably to industrial power and traction use. There is really nothing strikingly noticeable about what they have done in other directions. A few reports speak vaguely of an increase in the heating and cooking load. But as to figures regarding the actual position, they seem to have been overlooked in the press of other matters.

The makers of gas-stoves are not alone in having found occasion to mark-up their prices owing to ascending charges; their contemporaries in the electrical industry have discovered good reason for doing the same thing. The position of the General Electric Company in the electrical industry is a high one; and this concern would not, in view of the strenuous competition that exists between electrical manufacturers—a sort of cut-throat competition—have put up their prices to the extent they have done without good cause, and without a fair hope of being able to maintain them in the competition. The advances they have made in the prices of their goods are general. On electrical plant and machinery, the advance amounts to 10 per cent.; on lighting, wiring, instruments, and small power applications, advances are recorded from 5 to 20 per cent.; on glassware and heating and cooking apparatus, from 10 to 20 per cent.; and on telephones, batteries, and bells, 10 per cent. The India Rubber, Gutta Percha, and Telegraph Works, Ltd., also announce price increases on cables ranging from 10 to 20 per cent. Occasionally, the gas and electrical industries suffer in common.

There is a large amount of revision of tariffs for electricity supply going on in the country at the present time. Electricity undertakings great and small, undertakings affluent, and undertakings that are trying to keep up an air of respectability, though burdened with a load of poverty, are here, there, and almost everywhere considering the question of reductions as a matter of diplomatic policy. "You must come down to 0·5d. per unit for electricity for cooking and heating if you want to do any good in that direction," says the electrical engineer who likes to be considered progressive. And another says: "You must, in addition to selling electricity for these purposes at about or under generating fuel costs, supply expensive electric-cookers free or at a low rental, and maintain them on the same terms." All these things must be done to compete with gas, notwithstanding that, says the electrician, "a change-over from gas at any price per unit would pay the householder." There are many things in this world of ours that cannot be understood; and among them are certain inharmonious sayings of the electricians. However, the belief expressed by word is not, in this instance, the belief expressed by action. Among others, the Brighton Corporation Electricity Department has been considering the question of a revision of tariffs. There is a desire on the part of the Lighting Committee to reduce to 3d. the price per unit in respect of the supply to large shops using not less than 15,000 units per annum, and to make the same rate applicable to high candle-power metallic filament lamps for outside lighting. The policy of doing this was questioned at the last meeting of the Council, when the pressure applied caused certain members to "let the cat out of the bag." It is a question of the Committee being forced to concession, and that by the activity of the Gas Company, which the Electric Lighting Department take very seriously. "The circumstances are special," said Mr. Heun. "The fact is the Committee are in danger of losing the consumers in competition with the Gas Company; and they think it is worth a slight reduction to retain these customers." Then Mr. German acknowledged that the proposal is necessary in order to keep pace with the Gas Company; while Alderman Carden thought the concession reasonable in face of the strenuous competition of the Gas Company. The proposal was agreed to; and the Gas Company have no doubt already made note of the fact, with the view to seeing what has to be further done to intercept the Electric Lighting Committee in their checking movement. Brighton gives us one reason for the interest that is being taken in the question of reduced tariffs; but it is rather unfortunate that prices for electrical appliances are simultaneously moving upwards.

The Metropolitan Borough Councils with electricity undertakings under their management, have been, under the London County Council, enjoying maximum periods for the repayment of loans that the Local Government Board have, in respect of suburban and provincial electricity undertakings, decided are too long having regard to accrued experience as to the actual life of electrical plant and appliances. The Finance Committee of the County Council have been looking into the matter; and they agree with the Local Government Board. The Council are the loan-sanctioning body so far as the Metropolitan Boroughs are concerned; and so the Finance Committee last Tuesday recommended shorter periods. There is no objection to a term of sixty years for the repayment of loans for freehold land; and this period stands. The maximum period allowed for loans for buildings has been fifty years. Considered merely from the architectural point of view, there is no great objection to this. But these are buildings that call for consideration from the engineering standpoint. They have to house heavy running machinery and plant; and having regard to developments, some buildings may become obsolete for the purpose for which they were erected long before they are actually worn out. Therefore the half-century term for the repayment of loans for buildings comes down to thirty years. This accords with the views of the Local Government Board. Then the Council has had a maximum period of thirty years for mains; the Local Government Board now only allow periods varying from fifteen to twenty-five years, according to the manner in which the cables are laid. The County Council Committee think a twenty-five year period will suffice in future. Machinery and plant have hitherto had a maximum repayment period of twenty years allotted to them. The Local Government Board classify plant and machinery into groups, and have adopted periods varying from twenty to five years for the various pieces of apparatus. On the basis of antiquation, the Finance Committee consider twelve or fifteen years a reasonable period to allow; but, generously inclined, they take the latter and longer period. They do not recommend any change in the period of twelve years for house connections and ten years for meters. By the adoption of these periods, it is hoped the repayment of loans will be secured within periods approximately equivalent to the useful life of the works, and that replacements will, as far as possible, be avoided before heavy demands are made for this purpose.

The discussion on street lighting by flame arc and metallic filament lamps continues in the "Electrical Times;" but the figures that have been given must be very confusing to those who have not personal experience by which to check them, and desire to extract some really dependable information from them. For instance in the issue of our contemporary for July 25, in an article by "A Special Correspondent," there appear (on p. 78) the figures as to the costs of 8-ampere flame arc lamps; and the average depreciation is put at 15 per cent. We turn to pp. 80-2, to an article by Mr. J. Horace Bowden, of Poplar; and he puts the depreciation of 7-ampere flame lamps at 20 per cent. and interest at 4 per cent. "A Special Correspondent" places the depreciation of metallic filament lamp fittings at 10 per cent.; and Mr. Bowden at 5 per cent., with interest at 4 per cent. The last-named gentleman evidently does not consider cleaning and maintenance are required in connection with metallic filament lamps in the streets, for he makes no charge; while a "Special Correspondent" does. Bearing on the capital cost of flame arc lighting, the Finchley Council have approved of the erection of 25 flame arc lamps in the Great North Road, at a cost of £1341!

The Chancellor of the Exchequer has evidently set a very bad example to certain of our local governors; and the craze for robbing hen roosts is, probably in consequence of his example, growing among the latter. The depredation takes two different forms—either by diverting the gas profits from their legitimate uses, and relieving ratepayers of their obligations in respect of local expenditure, or else by running a municipal concern so that it cannot pay its way, and then compulsorily making the ratepayers subscribe the deficiency. There is not much to choose between these two modes of robbing the ratepayers. Mr. Dyke is a member of the Town Council of Kingston-on-Thames, and this gentleman holds, if we interpret him correctly, some curious views regarding the relations of electricity consumers and the ratepayers. For, according to him, the ratepayers of the town should be greatly obliged to those of their number who use electricity in preference to other agents, one of which, at any rate, can afford the same, and better, service; and, further than this,

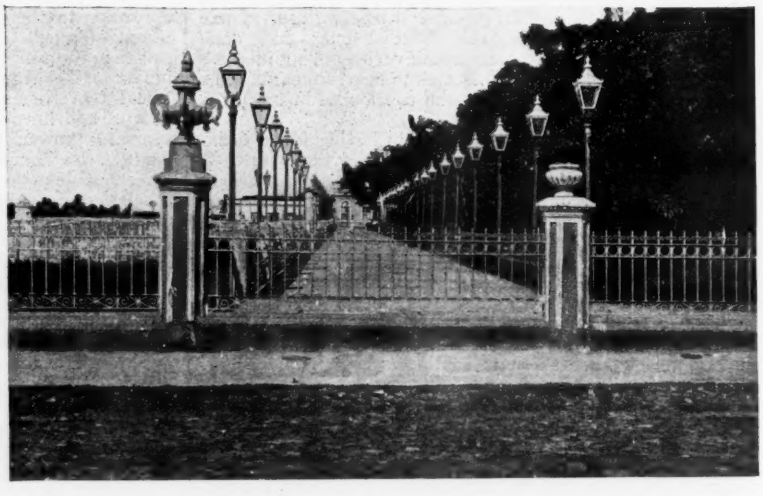
the ratepayers ought to be made to dip into their pockets and contribute to the support of the concern. The electricity undertaking, in short, is a sort of philanthropic institution that should be supported by compulsory instead of voluntary contributions. This is what Mr. Dyke is reported to have said at a recent meeting of the Town Council: "Consideration should be given to the consumers, and not to the ratepayers generally." There were cries of "Oh." "He took it they had no right whatever to save the pockets of the ratepayers at the expense of the users of electricity." That is unkind in view of the fact that the ratepayers have been called upon to contribute £15,274 16s. 8d. in order to keep the concern financially afloat. Mr. Dyke seems to have an idea that this sort of thing should go on perpetually, and that as councillors they should have no consideration for the ratepayers' pockets. The net loss on the undertaking in the past year was about £60. This was not much, but Mr. Dyke's view is that such close balancing of income and outgoings warrants a reduction in price to the consumers. He had better wait till the concern has well turned the corner; he had better see what is going to be the effect (if any) of the coal strike on the finances; and he had better inquire into the position of the concern in regard to its reserves. If we have mistaken the intention of Mr. Dyke, then we freely apologize to him.

The ratepayers of the same town are also much exercised over an agreement that has been entered into with Mr. Frank Bentall for the supply to his business establishment of electricity at a reduced price. There is the ugly cry of undue preference; and the Electric Lighting Committee decline to give the ratepayers anything that will satisfy them that undue preference has not been shown, or anything upon which other ratepayers can determine whether their custom is not entitled to the same consideration that Mr. Bentall has received. It is all very well to tell consumers that, if they offer custom under "similar circumstances," they will be treated in the same way as the consumer who is obtaining energy at a cheaper price; but if the consumers are not told what the circumstances are, how can they judge whether they can shape their demand so as to obtain the same consideration? The burgesses are simply asked to believe that the agreement is "in the best interests both of the general body of consumers and of the ratepayers at large." If this is so, then it is the best reason possible why the ratepayers should be told the terms of the agreement, and not have it secretly locked away from their sight. The intelligent and reasonable section of the ratepayers would rejoice with exceeding great joy over terms which they saw were in their "best interests," and they would compliment the Electric Lighting Committee on their business acumen. Then why not tell them the terms. As it is, they can only suppose something is being withheld from them that the Committee wish to conceal, and therefore doubt is cast over the tale as to the agreement being in the best interests of the ratepayers.

Reference was recently made in the "Memoranda" to the question of the payment of a bonus to Mr. A. H. Seabrook and other officials of the Marylebone Electricity Department, in respect of the past year's working and financial results. As we then stated there exists an agreement with the officials under which a certain bonus is to be paid them conditional on results. The results for the year fell short of the conditions, through, it is said, exceptional circumstances. Still the Electricity Supply Committee tried to get the Council to agree to the payment of a sum of £518 18s. 7d. as bonus. Visions of illegality rose before certain members of the Council. Counsel's opinion was taken by the Committee; and Counsel is of opinion that the Council can do as they like, by vote, with the ratepayers' money. A legal member of the Council put the case to another Counsel, and that learned gentleman was of a contrary opinion. Then the District Auditor was hoisted up, with face gloomy and inflexible, and insistent upon the bonus being surcharged. What with one thing and another, a majority of the Council were satisfied that the course of safety for them was through the non-payment of the bonus; and they settled themselves snugly down in the belief that there is precious little use in having an agreement if it is to be departed from in the manner suggested. Our sympathies go out to Mr. Seabrook, because during the year he has worked hard in the interests of the undertaking. Has he not talked and written during the municipal year of the tainting of food cooked by gas, of meat being cooked amid poisonous fumes in gas-ovens, and of other things detrimental and untrue about gas? Yet, no bonus! "Base ingratitude," murmur those most interested.

A WELL-LIGHTED AVENUE ABROAD.

THE accompanying reproduction of a photograph shows the new street lamps of Messrs. A. E. Podmore and Co. (of Charles Street, Hatton Garden), fixed along an extremely brilliantly lighted avenue in a city abroad. This is part of an installation of 2500 insect-proof inverted lamps, fitted with their patent cast-metal angle-burners (consuming 2¾ cubic feet per hour) which have been recently installed in the distant city in connection with an improved lighting scheme. The lamps themselves are described in a separate article appearing in the current issue of the "JOURNAL."



ASSOCIATION OF CONSULTING ENGINEERS.

THE first meeting of duly elected members of this Association took place a few days ago, under the presidency of Mr. G. Midgley Taylor, M.Inst.C.E., to receive the rules presented at the meeting held in January and the report and proposals of the Provisional Committee, and to elect the first Committee of the Association.

The Chairman, at the outset, stated that one of the questions which had been considered was the definition of a "consulting engineer;" and the Committee, after conferring with their legal advisers, had adopted the following: "A consulting engineer is a person possessing the necessary qualifications to practise in one or more of the various branches of engineering who devotes himself to advising the public on engineering matters, or to the designing and supervising the construction of engineering works, and for such purpose occupies his own office and employs his own staff, and is not directly or indirectly concerned or interested in commercial or manufacturing interests such as would tend to influence his exercise of independent professional judgment in the matters upon which he advises." Another question was the necessity for the Association, in view of the existence of the Institutions of Civil, Electrical, and Mechanical Engineers; and it was felt that there was a need for the formation of a society "specially devoted to the small proportion of consulting engineers who belong to the vast numbers of these Institutions." The objects of the Association were, briefly, to uphold the standard of professional conduct, and to promote the professional interests, rights, powers, and privileges of consulting engineers. These objects were equally in the interests of the public and of consulting engineers, and could obviously best be promoted by the creation of such an Association as the present. Since the meeting in January, the Committee had again reviewed the rules, which the Committee asked the members now to approve, with the following alterations: "(1) That the subscription be raised from one guinea to two guineas. (2) Corporate membership of the Institution of Civil Engineers or full membership of the Institution of Electrical or Mechanical Engineers be accepted as evidence of technical qualifications for membership of the Association. (3) That members be entitled, and requested, to use the abbreviation M.Cons.E. when stating their qualifications. (4) That the Committee be increased to eighteen, of whom not more than twelve shall be London members." The meeting approved of the alterations. The following gentlemen were chosen as the London members of the Committee for the current year: Messrs. J. S. Alford, H. P. Boulnois, W. T. Douglass, Baldwin Latham, E. L. Mansergh, W. M. Mordey, W. H. Patchell, H. Rofe, John F. C. Snell, E. H. Stevenson, James Swinburne, and G. Midgley Taylor; the country members being left, on the understanding that the Committee would fill the list with the best names they could find for the provincial towns.

SOUTH METROPOLITAN GAS COMPANY.

THE following is the report of the Directors of this Company for the six months ended the 30th of June, which, with the accounts (an abstract of which appears below), will be presented to the proprietors at the half-yearly meeting to-morrow week.

The national coal strike has cost the Company's consumers, shareholders, and employees £89,000 during the last half year. It has been necessary to spend this amount in order to replace and provide coal undelivered by reason of bad working at the pits under the Mines (Eight Hours) Act, or unobtainable in England by reason of the national stoppage. The Official Auditor has certified that £75,000 is a proper amount with which the insurance fund may be debited in respect of this extra cost; and this sum has therefore been transferred to net revenue account. Throughout the strike, the Company maintained undiminished the supply, quality, and purity of gas at the usual standard, which is well above its parliamentary obligations.

Contracts have been entered into for both coal and freight at a very considerable increase over those which have been current (with a single exception) during the past forty years, and at prices which industry could not sustain if they were likely to be permanent. There is every reason, however, to expect that coal will be obtainable at prices much nearer its normal value when the time for contracting returns.

Apart from this disturbing feature, the working results of the past half year have been very satisfactory. After payment of debenture interest and sliding-scale dividend at the rate of £5 9s. 4d. per cent. per annum, there will be an increase of £28,057 in the amount carried forward.

The consumption of gas shows an increase of 2·6 per cent.—a proof that its popularity is well sustained in the various uses for which it is now available.

The carbonizing results have continued at their high level, the production of gas being 12,275 cubic feet per ton of coal. The cost of plant renewals continues heavy, especially that required for gas purification; but the advantage of this will be gained in the near future.

The officers' and workmen's superannuation funds have already been sanctioned by the shareholders. A supplementary employees' fund has recently been formed, to meet those cases hitherto dealt with out of revenue charges, and for which the present funds do not provide. The shareholders' approval is asked to this proposal.

In accordance with the expressed wish of the workmen, arrangements have been made to register the Company's provident fund (which was started in 1842) as an Approved Society under the National Insurance Act. The unanimity of the request cannot be regarded otherwise than as a great tribute to the feeling of confidence between employer and employed, which has grown up so strongly under co partnership, and which the Directors have great pleasure in recording year by year.

Mr. James Waterer has been elected an Employee-Director in place of Mr. James D. C. Hunter, who resigned on his promotion and transference to East Greenwich.

CHARLES CARPENTER, Chairman.

July 22, 1912.

The following are the principal portions of the accounts accompanying the preceding report.

The first two statements relate, as usual, to the stock and loan capital. The former sets forth that the standard rate of 4 per cent. is payable on £6,011,224 and £418,671 (Act of 1901) of stock; while the latter shows that the loan capital, the rate of interest on which is 3 per cent., amounts to £1,798,994 and £96,451 (Act of 1901). The third statement is the capital account. It stands as follows: Amount received, £5,328,820; nominal amount added by conversion (less premium), £2,996,520—total, £8,325,340. The items of expenditure are as follows:—

Capital account to Dec. 31, 1911			£5,079,659 0 7
Expenditure during half year to June 30, 1912, viz.—			
New and additional mains and services	£1,835 14 2		
New and additional meters	1,163 16 5		
New and additional stoves	1, 73 3 0		
Total	£4,172 13 7		
Cr. by sale of land	100 0 0		
		4,072 13 7	
Total expenditure			£5,083,731 14 2
Balance			245,088 5 10
			£5,328,820 0 0
Nominal amount added by conversion, less premium			2,996,520 0 0
Total			£8,325,340 0 0

The net revenue account shows a sum of £329,783 12s. 5d. applicable to dividend on the ordinary stock. Following this are the statements relating to the reserve, renewal, and insurance funds. They show that the balances on June 30 were as follows: Reserve fund, £191,369; renewal fund, £33,861; insurance fund, £21,497. A sum of £258 is charged to this fund for loss on coal by heating; also £4660 for depreciation of investments, and £75,000 for the extra cost of coal entailed by the strike.

The following is the revenue account:—

Expenditure.

Manufacture of gas—			
Coal into store, including £2883 6s. for London Port and tonnage dues	£416,705 2 4		
Purification	30,167 15 4		
Salaries of Engineer and Officers at works	16,513 1 11		
Wages (carbonizing)	49,312 2 2		
Repairs and maintenance of works and plant, less £5590 10s. 9d. received for old materials	126,112 4 4		£638,810 6 1
Co-partnership for twelve months to June 30, 1912	45,350 10 5		
Less on account	16,000 0 0		29,350 10 5
Distribution of gas—			
Repair, maintenance, and renewal of mains and service-pipes	£45,334 7 4		
Salaries and wages of officers, including rental clerks	21,6 0 14 1		
Repairing and renewals of meters	30,496 6 1		
Repairing and renewals of stoves	39,432 1 10		
Repairing and renewals of gas-fittings	47,860 18 4		184,754 7 8
Public lamps, labour and materials £15,627 7s. 10d., less £14,890 3s. 9d. received for the same			737 4 1
Rents, rates, and taxes—			
Rents payable	£1,358 0 8		
Rates and taxes	53,796 4 9		55,154 5 5
Management—			
Directors' allowance	£2,837 15 0		
Salaries of Secretary, Accountant, and clerks	4,837 1 1		
Collectors { Ordinary	6,020 13 1		
Collectors { Slot meter	10,178 14 0		
Stationery and printing	3,722 8 10		
General charges	11,910 10 1		
Company's Auditors	112 10 0		39,619 12 1
Miscellaneous—			
Law charges			667 1 9
Parliamentary charges			630 1 8
Bad debts			1,326 15 5
Stolen from 2693 slot meters broken open			388 14 8
Sick, accident, and superannuation funds			17,553 1 7
Gas Referees and Official Auditor			343 18 4
Leasehold renewal fund			300 0 0
Total expenditure			£969,635 19 2
Balance carried to net revenue account			160,213 0 1
			£1,129,848 19 3

Receipts.

Sale of gas—			
Lady Day, at 2s. 2d. per 1000 feet	£403,021 0 0		
Midsummer, at 2s. 2d. per 1000 feet	284,134 8 11		
	£687,155 8 11		
Public lighting	16,976 19 6		£704,132 8 5
Company's meters at rent: Ordinary, 95,434; slot, 260,757	£40,799 5 3		
Company's stoves at rent: Ordinary, 80,731; slot, 214,264; fires, 33,280	33,611 12 0		
Gas-fittings	45,775 2 8		120,085 19 11
Residual products—			
Coke, less labour and cartage	£179,762 13 6		
Breeze, less labour and cartage	4,748 11 11		
Tar and tar products, less labour	42,732 15 10		
Sulphate of ammonia, ,, ,,	76,859 14 5		304,003 15 8
Rents receivable			1,515 2 9
Transfer fees			111 12 6
Total receipts			£1,129,848 19 3

Total amount paid in salaries for half year, £43,603 6s. 8d.
,, ,, ,, wages ,, £298,219 7s. 11d.

The following statements relate to the manufacturing operations of the Company:—

Statement of Coal.

In Store Dec. 31, 1911.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store June 30, 1912.
Tons.	Tons.	Tons.	Tons.	Tons.
222,895	465,269	553,615	1,251	133,298

Statement of Residual Products.

Description.	In Store Dec. 31, 1911.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1912.
Coke—cwt.	620,472	6,813,053	1,646,352	5,467,298	319,875
Breeze—yards	13,900	107,462	44,796	64,555	12,011
Tar—gallons	314,095	5,213,067	5,013,835	113,177	400,150
Ammoniacal liquor—butts	11,265	205,715	207,550	..	9,430

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	Incandescent.
6,795,885	178,235	6,445,610	6,710,249	24,426

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £82,200; coke and breeze, £12,429; tar, sulphate, and ammoniacal liquor, £56,681; and sundry plant and stores, £312,490. The figures this time last year were: Coal, £86,786; coke and breeze, £20,071; tar, sulphate, and ammoniacal liquor, £32,597; and sundry plant and stores, £312,531. A sum of £32,084, co-partnership bonuses and savings, has been deposited with the Company; and the total of the superannuation and guarantee funds is £69,351. The figures last year were £28,756 and £55,345.

INSURANCE ACT [PART II.] AND GAS WORKERS.

Position of Gas-Fitters Engaged in Piping Houses.

We have received from Mr. R. W. Edwards, the General Manager of the Aldershot Gas, Water, and District Lighting Company, a copy of correspondence which has recently passed between the Institution of Gas Engineers, the Gas Companies' Protection Association, Mr. Alex. Wilson, and himself, in which attention is called to a decision of the Umpire under the National Insurance Act, recorded in the "Journal" last week (p. 316), that "a workman described as a gas-fitter, fixing and running pipes to buildings," is liable for the payment of contributions. This decision, Mr. Edwards submits, does not support the contention as to the Umpire's consistency. The following are the principal features of the correspondence.

On the 17th ult., Mr. Edwards wrote to Mr. Wilson on the subject of his classification of men who will or will not require to come under Part II. of the National Insurance Act, as given in the "Journal" for the 16th ult. (p. 175), and said there were two classes regarding which he should be glad to have Mr. Wilson's opinion—viz., blacksmiths mainly engaged in repairing retort-house tools, rakes, coke-barrows, &c.; and bricklayers mainly engaged in patching retorts, cleaning flues, and repairing furnaces, &c., and doing also repairs to carburetted water-gas plant linings. Mr. Wilson replied the next day as follows:

Blacksmiths engaged in repairing retort-house tools, rakes, &c., do not come under the Act; but if constantly employed repairing coke-barrows, they would come under it. I take it, however, that the repairing of coke-barrows will only form a small part of your blacksmiths' time; and in that case they would not be "wholly" or "mainly" employed on this work, and would therefore be outside the scope of the Act. Bricklayers engaged in patching retorts, &c., or in repairing carburetted water-gas plant linings do not come under the Act. Bricklayers only come under the Act when engaged wholly or mainly in the work of construction, alteration, repair, decoration, or demolition of "buildings," or in the construction, reconstruction, or alteration of "gas retorts" or "benches." The Umpire's interpretation of the words "wholly" or "mainly" is: "It may be taken that the words 'wholly' or 'mainly' apply to the period of service for which the wages were then paid," and the word "alteration" refers to work which involves a substantial change or variation in the original design.

Mr. Edwards expressed his thanks to Mr. Wilson for his reply, and said he had found in the "Board of Trade Labour Gazette" that the Umpire had decided that "workmen engaged in making and repairing steel barrows for ashes" were not liable for contributions. As he thought this decision would be applicable to coke-barrows, he asked Mr. Wilson to be good enough to give his opinion on the point. This he did promptly. He said he considered it might be taken, from the Umpire's decision, that the work on all kinds of wheel-barrows would be exempt. He added: "My impression is that this only refers to barrows with one or two wheels. When the barrows or bogies have four wheels, I believe they will be classed as vehicles, and come under the Act."

Mr. Edwards then addressed letters to the Secretary of the Institution of Gas Engineers (Mr. Walter T. Dunn) and the Secretary of the Gas Companies' Protection Association (Mr. F. E. Cooper), pointing out that in the joint report issued by them it was stated that workmen engaged wholly or mainly on the carcassing of buildings with gas-pipes were to be included in the unemployment section of the Act. But he said he had noticed a recent decision of the Umpire [No. 407] which included gas-fitters "repairing for escapes." He therefore would be glad to know whether, in their opinion, this was intended to include all gas-fitters, as, of course, the ordinary routine includes both piping and repairing escapes. He also called Mr. Wilson's attention to this decision, and asked him if he considered all gas-fitters would require to be included. Mr. Cooper, in acknowledging the letter, said he was aware of the apparent discrepancy between the decisions of the Umpire on the matter referred to, and he had written Mr. Wilson thereon. Mr. Dunn had also sent a copy of Mr. Edwards's letter to Mr. Wilson, whose reply to Mr. Cooper, copies of which were sent to Mr. Edwards and others, deals fully with the matter. In the course of it he said:

In my opinion, the Umpire is perfectly consistent in his decisions; the decision referred to applying to the permanent pipes in a building. In the report drawn up by the Sub-Committee under "Distribution Department," contributions are said to be payable by workmen "wholly" or "mainly" employed on the *carcassing* of buildings "with gas-pipes." I think it may be taken that decision No. 407 applies to these pipes, and that the laying of services or any work thereon is specifically excluded. Also, I think, we are quite entitled to assume as to the fixing of gas fires and cookers, that these being, like gas brackets, chandeliers, or electroliers, not permanent parts of a building, any work on them or in connection therewith is excluded from the Act. In this connection, I note that one decision (No. 405) excluded the erection of sun-blinds on houses and preparing same for erection—no doubt for the same reason—that they do not form a permanent part of a building.

Mr. Wilson added that he thought it would be in the interest of the gas industry if the various companies and corporation gas departments would send their queries to the Committee, instead of applying direct to the Umpire, so that the points might be discussed by them before application was made to the Umpire, and thus avoid incorrect or insufficient information being supplied to him on the question.

The next point raised by Mr. Edwards was in a letter to Mr. Cooper, in which he referred to Mr. Wilson's remark as to the fixing of fires and cookers being like gas-brackets, chandeliers, &c. He said he had noticed a further decision of the Umpire as to "a workman, described as a gas-fitter, fixing and running gas-pipes and fittings to buildings," which would appear to include in the Act the fixing of fittings; and under this category he presumed the above-mentioned appliances would come. Mr. Cooper replied that if the workmen referred to were wholly or mainly employed as gas-fitters for the purposes mentioned in the Umpire's decision, they would come under the provisions of the Act; but if not, he did not think they would do so.

Replying to Mr. Edwards on the subject of decision No. 548, Mr. Wilson said he had not seen it at the date of his previous letter. He was, however, writing Mr. Cooper with reference to it and another decision, which, unless modified, were "quite contrary to the previous decision of the Umpire"—*i.e.*, that relating to services, which were exempt from the Act. Meantime, he was taking the decision as to services as correct, and did not propose to alter the arrangements at Glasgow until further advised.

Additional Decisions by the Umpire.

The last number of the "Board of Trade Journal" contains a number of additional decisions by the Umpire; among them being the following: Contributions are payable by workmen engaged in the work of "installing pipes, &c., in buildings for acetylene gas," but not by those employed by the gas department of a city council, and engaged in "fixing and removing (removable) gas-stoves."

RATING OF GAS AND WATER UNDERTAKINGS.

It will probably be in the recollection of many of our readers that last year Mr. Arthur Valon contributed to the "Journal" a series of articles on the subject of "The Rating of Gas and Water Undertakings." They have since been revised and published in book form.* In a prefatory "Note," the author explains that he has endeavoured to show the practical application of the principles laid down in the Acts of Parliament; and also by legal decisions, to the making of a valuation of a gas or water undertaking for the purpose of assessment to the poor-rate. The law of rating has only been dealt with so far as was necessary for this purpose; and the decisions and *obiter dicta* quoted have all been selected to this end. In addition, an outline of the procedure to be followed on making a rate, or when appealing against one already made, has been included for the benefit of those who only deal with such matters occasionally.

In his introductory chapter, the author takes the reader back to the time of Elizabeth, and shows how liability to be rated to the relief of the poor came to be imposed. In the Act then passed—the well-known "Act of Elizabeth"—the method of ascertaining each person's relative contribution to the rate was not prescribed; nor was the basis upon which it was to be computed. This was done by the Parochial Assessments Act, 1836, in which it is laid down that the poor-rate is to be made "upon an estimate of the net annual value of the several hereditaments rated thereunto." In London, the procedure relative to assessment is governed by the Valuation (Metropolis) Act, 1869, in which the terms "gross value" and "rateable value" are clearly expressed. In order to find the latter, Mr. Valon explains that "it is necessary to estimate the rent which a tenant would pay under given conditions, and the amount of the deductions allowable as landlord's expenses." Here we are introduced to our old friend the "hypothetical tenant," who is a conspicuous figure in all rating questions; and Mr. Valon proceeds to consider what this mysterious person would be willing to pay as rent, and the profit he would be likely to realize. He next deals with the basis for estimating future rent, and making a valuation of an undertaking, and quotes some decided cases.

After these preliminary remarks, Mr. Valon goes in detail into the subject of the rating of gas undertakings—taking up first receipts and expenditure, then tenant's capital and share, and afterwards the landlord's statutable deductions. A chapter is devoted to apportionment, structural valuation, the effect of statutory restriction of profits, and undertakings which are not worked for profit. In the succeeding chapter, water undertakings are dealt with. Some useful information is given on the subject of the procedure on appeal, and on appeals to Quarter Sessions. This completes the text, which occupies 80 pages. In appendices will be found two sample valuations and the judgments in the Lee and Ipswich cases. These are followed by an index.

The author has devoted considerable attention to rating questions; and the last number of the "Journal" contained a paper read by him at the recent meeting of the Institution of Water Engineers. In the book under notice, he has presented in a convenient form a great deal of information which will be found useful by those who are seeking enlightenment on an admittedly difficult subject.

* "The Rating of Gas and Water Undertakings." By Arthur Valon, Assoc.M.Inst.C.E. London: Walter King, Office of the "Journal of Gas Lighting;" 1912.

THE QUALITY OF LONDON GAS

In the Second Quarter of 1912.

THE following tables give the customary summary of the results of the testings made in the official testing-places controlled by the London County Council of the quality of the gas supplied by the three Metropolitan Gas Companies during the second quarter of the year—*i.e.*, the thirteen weeks ended June 29. The corresponding figures for the first quarter of the year will be found in the "JOURNAL" for April 23, p. 215, where references are also given to articles dealing with the results for past years. As in the first quarter of the year, the results for the last quarter were seriously affected by the cessation of regular supplies of coal owing to the miners' strike—a matter which will be more especially referred to towards the close of this article.

ILLUMINATING POWER.

The average results of the testings of illuminating power with the standard No. 2 "Metropolitan" argand and with the prescribed flat-flame burner are shown for each Company in Table I. for the past quarter and the corresponding quarter of 1910 and 1911. It will be seen that there has been an appreciable fall in the average illuminating power of the gas supplied by the Gaslight and Coke Company and the South Metropolitan Company, as compared with the corresponding quarters of the two previous years; but, on the other hand, there has been a rise in the average illuminating power of the gas supplied by the Commercial Company. The minimum results for the quarter with the testings with the standard argand burner were: For the Gaslight and Coke Company, 12·49 candles; for the South Metropolitan Company, 13·36 candles; and for the Commercial Company, 14·00 candles. All these *minima* occurred in the first three weeks of the quarter, and may, therefore, be regarded as directly due to the difficulties caused by the miners' strike. These, and the other low returns of illuminating power during the quarter, will be referred to again in connection with the strike. The minimum results obtained with the flat-flame burner during the quarter were: For the Gaslight and Coke Company, 6·22 candles; for the South Metropolitan Company, 6·81 candles; for the Commercial Company, 7·35 candles. All these *minima* occurred in the first half of the quarter.

TABLE I.—*Averages of All Testings of Illuminating Power for the Second Quarter of the Year* [*Candles*].

Company.	No. 2 "Metropolitan" Argand.			Flat-Flame.		
	1910.	1911.	1912.	1910.	1911.	1912.
Gaslight and Coke Company . . .	15·14	15·00	14·46	9·07	8·75	8·25
South Metropolitan Gas Company . .	16·00	15·81	15·53	10·35	10·08	9·27
Commercial Gas Company . . .	14·73	14·61	15·03	8·74	8·47	8·65

CALORIFIC POWER.

A summary of the results of the testings of calorific power of the gas supplied by each company last quarter, and in the corresponding quarter of each of the two preceding years, is given in Table II. It will be seen that the average calorific power for the Gaslight and Coke Company for last quarter is 3 to 4 calories per cubic foot lower than in the second quarters of 1910 and 1911. For the South Metropolitan Company, there is a fall of about 2·3 calories from the value for the second quarter of 1911, which again was appreciably lower than the mean calorific power for the same quarter of 1910. There is only a very slight falling off in the calorific power of the gas supplied by the Commercial Company. The minimum result for the calorific power tests during the quarter on the gas supplied by the Gaslight and Coke Company and the South Metropolitan Company was above 112½ calories net per cubic foot, which is the figure below which the calorific power of the gas supplied by the former Company may not fall on the average of three consecutive days' testings without the Company becoming liable to incur a forfeiture. The Commercial Gas Company had one result during the quarter which was below this standard; but the Company are not under any statutory obligations in respect of the calorific power of the gas which they supply.

TABLE II.—*Summary of Testings of Calorific Power (Gross and Net) for the Second Quarter of the Year* [*Calories per Cubic Foot*].

Company.	Average.			Maximum.			Minimum.		
	1910.	1911.	1912.	1910.	1911.	1912.	1910.	1911.	1912.
Gaslight and Coke—									
Gross	137·5	138·4	134·4	154·8	148·6	145·4	128·3	130·0	123·7
Net	122·2	123·3	119·9	139·4	132·4	130·4	113·4	114·3	112·6
South Metropolitan—									
Gross	147·2	145·3	142·9	158·0	154·8	154·3	135·8	134·7	132·7
Net	131·0	129·5	127·3	140·9	139·4	137·5	121·0	120·2	118·2
Commercial—									
Gross	138·1	137·2	136·0	159·4	151·7	147·9	118·3	124·0	123·8
Net	123·3	122·3	122·0	143·0	132·5	134·6	106·1	110·0	112·0

It will be interesting to compare the results of the testings of calorific power made in the past quarter with the new standard of calorific value which has been approved by the Committee of the House of Commons on the South Suburban Gas Company's Bill of this session. According to this Bill, the gross calorific value of the gas supplied should not be less than 475 B.Th.U. per cubic foot; but if the deficiency does not exceed 28 B.Th.U., testings are to be made on the two following days and the average of the three days' testings are to be taken to represent the calorific value of the gas on the first day. Putting aside for the moment this provision for preventing the Company being fined in respect of a single small deficiency, it may be said that the South Suburban Gas Bill requires the gross calorific value of the gas to be maintained at not less than 475 B.Th.U. per cubic foot. Converting the figures reported last quarter for the three Metropolitan Gas Companies into terms of B.Th.U. per cubic foot, it will be found that the gross calorific value for the Gaslight and Coke Company averaged 533·3 B.Th.U., with a minimum of 490·8 B.Th.U.; for the South Metropolitan Company, it averaged 567 B.Th.U., with a minimum return of 526·6 B.Th.U.; and for the Commercial Gas Company, it averaged 539·6 B.Th.U., with a minimum return of 491·2 B.Th.U. These comparisons indicate that if the provisions of the South Suburban Gas Bill had been in force in the Metropolis in the past quarter, the Gas Companies would have fulfilled the requirements, and have had a reasonable margin of safety against liability to forfeiture.

SULPHUR.

The average and maximum results of the testings of the amount of sulphur contained in the gas supplied by the three Companies during the first quarter of the three years are shown in Table III.

TABLE III.—*Summary of Testings of the Sulphur in London Gas for the Second Quarter of the Year* [*Grains per 100 Cubic Feet*].

Company.	Average.			Maximum.		
	1910.	1911.	1912.	1910.	1911.	1912.
Gaslight and Coke Company . . .	35·0	33·9	34·3	59·3	56·1	52·3
South Metropolitan Gas Company .	32·8	26·3	24·1	68·6	44·1	44·8
Commercial Gas Company . . .	28·9	29·8	25·0	52·7	51·6	40·6

It will be seen that while there is practically no change in the average amount of sulphur in the gas supplied by the Gaslight and Coke Company, there has been an appreciable fall in the average amount of sulphur in the gas supplied by the other two Companies.

EFFECT OF THE MINERS' STRIKE.

It is difficult to fix a definite term to the period in which the manufacturing operations on London gas-works were seriously affected by disorganization in the deliveries of coal consequent on the miners' strike. It was long after the majority of the miners had returned to work before regular deliveries of coal began to be resumed at the London gas-works; and then many of the latter became affected by the strike of transport workers. It would not be unreasonable to assume that the manufacturing operations had not resumed their normal course even at the close of the half year. The gas companies were more or less hampered by the consequences of the strikes throughout the quarter under review. It has been shown in the foregoing that, nevertheless, the calorific power of the gas was maintained, with one trifling exception, above the standard prescribed for the Gaslight and Coke Company. In regard to illuminating power, however, there were a number of returns below the figure of 13½ candles, which is the limit at which the Companies become liable to incur forfeitures for deficiencies of illuminating power. The weekly returns issued by the London County Council give only the minimum return during the week at each testing-place; and where this minimum is below the penalty limit, it is impossible to say from the returns that on other days in the same week, and at the same testing-place, other returns falling between the minimum reported and the penalty limit have not been made. Putting aside, however, the question of such undisclosed returns, Table IV. shows the number of testing-places at which low returns were reported each week.

In regard to cases in which the illuminating power on a single day has been found to be below 14, but not below 13 candles, the average of three days' testings is deemed to represent the illuminating power for the middle one of the three days; and it is, therefore, likely that on this basis many of the returns shown in the foregoing table as below 13½ candles for a single day's testing will not give results below 13½ candles when averaged with the returns for the preceding and following day. It is impossible to say also from the data available in how many cases the Company might be liable to incur forfeitures in regard to the result of a single day's testing. In the past quarter, however, the Companies will doubtless be able in all cases to avail themselves of the provision of the Gas Acts that "No forfeiture shall be incurred in any case in respect to which it is certified by the Chief Gas

TABLE IV.—*Deficiencies of Illuminating Power in the Second Quarter of* 1912.

Week Ending	Company.	Number of Testing Places from which Returns were Made.		
		Below 12½ Candles.	Between 12½ and 13 Candles.	Between 13 and 13½ Candles.
April 6	Gaslight and Coke	..	..	1
,, 6	South Metropolitan	..	..	2
,, 13	Gaslight and Coke	1	1	4
,, 13	South Metropolitan	..	..	1
,, 20	Gaslight and Coke	..	..	1
,, 27	,, ,,	..	..	1
May 11	,, ,,	..	..	1
,, 18	,, ,,	..	..	1
,, 25	,, ,,	..	..	1
June 1	,, ,,	..	1	..
,, 8	,, ,,	..	..	1
,, 15	,, ,,	..	..	2
,, 22	,, ,,	..	1	..

Examiner that the defect was occasioned by unavoidable cause or accident." The cause of the deficiencies reported was undoubtedly the irregular supply of coal due to the strike of the miners, which was unavoidable by the company.

THE LOAD FACTOR OF GAS SUPPLY.

[COMMUNICATED.]

So far as the writer is aware, there has been very little, if any, reference in the technics of gas administration to the load factor. Mr. H. Townsend's paper at the recent meeting of the Institution of Gas Engineers touched upon the matter, with more particular reference to the day-load factor.

The term "load factor" is one which arose from the exigencies of electric supply; and, as is well known, the factor has an enormous influence upon the commercial operations of "our friend the enemy." The term is defined by the "Electrical Times" as follows:

"Ratio of actual output in units delivered to consumers to the possible output if the maximum load were constantly in use throughout the year or period of supply"

$$= \frac{\text{number of units sold} \times 100}{\text{maximum simultaneous load on feeders in kws.} \times \text{hours of supply period.}} = x \text{ per cent.}$$

So that if, for example, the number of units sold is 6,000,000, over a supply period of one year—*i.e.*, 8760 hours—while the maximum load for an hour during this period is 3400 units, we have—

$$\frac{6{,}000{,}000 \times 100}{3400 \times 8760} = 20{\cdot}1 \text{ per cent.}$$

The significance of the factor is that, while the station engineer must have plant installed adequate to supply at any time the maximum demand upon him, in this particular instance only some 20 per cent. of the plant is employed *on the average* throughout the year. The higher the factor, the lower become the undertaking's standing charges per unit supplied.

The unit of time involved in ascertaining the load factor is universally taken at one hour—that being the time taken for the maximum load reading—though in at least one recent instance a proposal has been made to take quarter-hour maximum demand readings.

The fact that the electrical engineer only generates and supplies electric energy as and when demanded—in other words, he has no practicable means of storage—shows the fundamental importance to him of the load factor. If the engineer could instal plant to meet the *average* demand, with a margin for the purpose of accumulating energy to meet the extra demand when the peak of the load comes on, he would be in a much improved position as regards his total cost of supply. Here it is that the gas engineer steps in with vastly improved facilities at his disposal. The load factor of gas supply is a much more satisfactory term than the best afforded under present conditions of electrical supply, which in the most favourable cases can only show a figure in the neighbourhood of 30 per cent.

Gas undertakings are primarily designed on a basis of 24-hours' maximum supply, with the usual contingency reserve; and the day of 24 hours is, therefore, the time-basis in ascertaining their load factor. Take, as an example, the 1911 figures given in "Field's Analysis" for the three London Gas Companies. The data are as follows:—

Gaslight and Coke Company.—Number of cubic feet sold 27,682,198,000. Maximum daily delivery 122,738,000.

The load factor is, therefore,

$$\frac{27{,}682{,}198{,}000 \times 100}{122{,}738{,}000 \times 365} = 61{\cdot}8 \text{ per cent.}$$

For the Commercial Gas Company—

$$\frac{3{,}550{,}376{,}000 \times 100}{14{,}722{,}000 \times 365} = 66{\cdot}07 \text{ per cent.}$$

For the South Metropolitan Gas Company—

$$\frac{13{,}136{,}448{,}000 \times 100}{54{,}481{,}000 \times 365} = 66{\cdot}06 \text{ per cent.}$$

The interpretation of these figures is that in the case of these three undertakings the plant available for the supply of their maximum daily deliveries is employed throughout the year to the extent, on the average, of over 60 per cent. of its full capacity. By the word "plant" is, of course, implied not only generating and purifying apparatus, but storage plant and distributing system. This use of the load factor shows the enormous advantage of facilities for storing gas in meeting the varying demands throughout the day. If the gas industry were in the position of electrical suppliers, and had to *hourly* meet the fluctuating demands for gas, it is difficult to conceive the size of the increased generating plant that would be necessary to supply gas to meet the requirements (say) of the hours from 11 to 1 on an average Sunday morning.

An examination of the terms of the factor brings out many interesting and useful points. For instance, consider the variations of the maximum daily delivery. If this figure is high, the factor is lowered. In other words, a single day of low temperature, or abnormal fog, would result in a high maximum delivery; and the load factor for the year containing that day would be lower in consequence. A winter season of moderate severity, without any prominent "high-consumption" days, is conducive, therefore, to a high load factor. An examination of the yearly load factors for an individual undertaking shows very clearly the influence of the "very cold" day. Thus, in the year 1908 a gas company known to the writer achieved a record maximum-day output, and the load factor for the year was 53·8 per cent. In the following year, which did not show any abnormalities of output, the winter being only moderately cold, the load factor increased to 62·8 per cent. To complete the story, the next two years, 1910 and 1911, showed factors of 61·2 and 62·9 per cent. respectively. It seems, therefore, that any influence that can be brought to bear upon the magnitude of the maximum day delivery, in its relation to the load factor, is largely out of the hands of the gas engineer. The vagaries of the weather have clearly the last say in the matter.

It is, however, more profitable and reassuring to turn one's attention to the other term in the load-factor equation—namely, the total number of cubic feet sold per annum, or, what amounts to the same thing, the total amount divided by 365, being thus the daily average. The higher this latter figure is, in comparison with the maximum daily delivery, the higher will be the load factor of the undertaking. It is clear that a large summer load of such a kind that it would not also operate at the time of maximum supply, would give a high load factor on the year's working. The gas-cooker load, in so far as it is more particularly a summer load, has this advantageous effect. But fortunately with many, if not most, undertakings the gas-cooker, if once used, is generally always used, even in the winter period; so that the load factor has not appreciably improved with the advent of cooking by gas. Gas-fires, on the other hand, distinctly tend to lower the load factor, as their use is a winter one, and, indeed, they are the chief cause of the high maximum-delivery which a very cold day always calls forth.

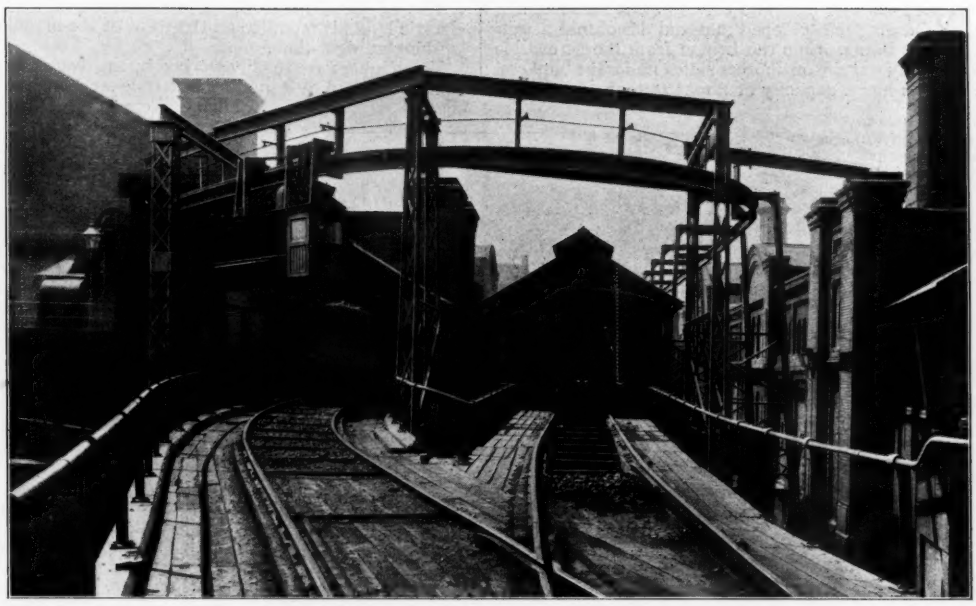
It is not intended to establish by these notes any exaggerated significance for the load factor in gas supply. Indeed, the fact that the expression is almost unknown among gas engineers is sufficient proof that the influence the factor has on gas administration is a very slight one. One point which comes out clearly is that the day-load factor—that is, the ratio the day-time supply bears to the night supply—can have no significant effect upon the administration of a gas undertaking which is designed and operated upon a 24-hours' basis. In so far as the day load increases the yearly output without also increasing the maximum day's delivery, it reacts favourably upon the undertaking; but any advantage claimed for the day load over the night load, apart from increasing the total daily consumption, is clearly illusory in gas supply, though the very converse of this state of affairs holds in electricity supply.

In conclusion, the following load factors, selected from a gas undertaking over a number of years, show that the great changes in the nature of gas supply due to the successive advents of gas cooking, gas heating, and the incandescent mantle, have made little or no difference in the load factor.

Year.	Load Factor. Per Cent.	Year.	Load Factor. Per Cent.
1832	62·6	1878	42·1
1833	64·8	1879	53·9
1834	64·6	1886	48·1
1835	62·9	1887	48·9
1850	58·3	1895	50·8
1851	51·6	1896	49·4
1852	57·4	1897	50·9
1853	50·2	1908	53·8
1865	49·3	1909	62·8
1866	48·5	1910	61·2
1877	50·3	1911	62·9

Mr. William Allott, the Managing-Director of Messrs. Newton, Chambers, and Co., Limited, of Chapeltown, near Sheffield, and the General Manager of their collieries, left estate of the gross value of £10,051.

ELECTRIC TELPHER PLANT AT THE REDHEUGH WORKS OF THE NEWCASTLE-ON-TYNE AND GATESHEAD GAS COMPANY.



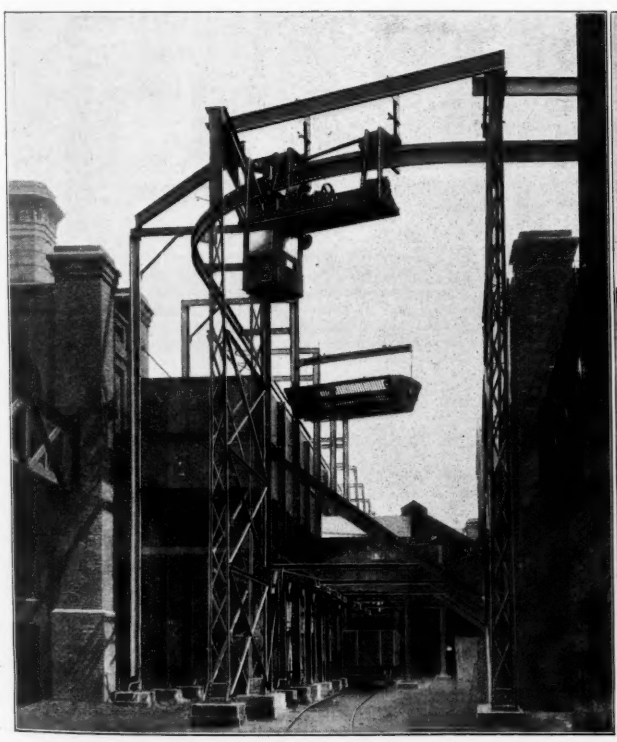
General View of Telpher passing round Curve at End of Retort-House and over Elevated Siding for Coal Waggons.

A VERY large telpher plant has recently been installed at the Redheugh Gas-Works to handle the whole of the hot coke produced in the No. 1 retort-house—the benches being heated by means of outside producers. The house contains two benches of horizontals, each bench consisting of ten beds of nines—a total of 180 retorts. The length of the retort-house is 240 feet; and the retorts are charged and discharged by a machine stoker. The house is of the stage-floor type; the bottom retort mouthpieces being about 18 inches above the stage-floor level.

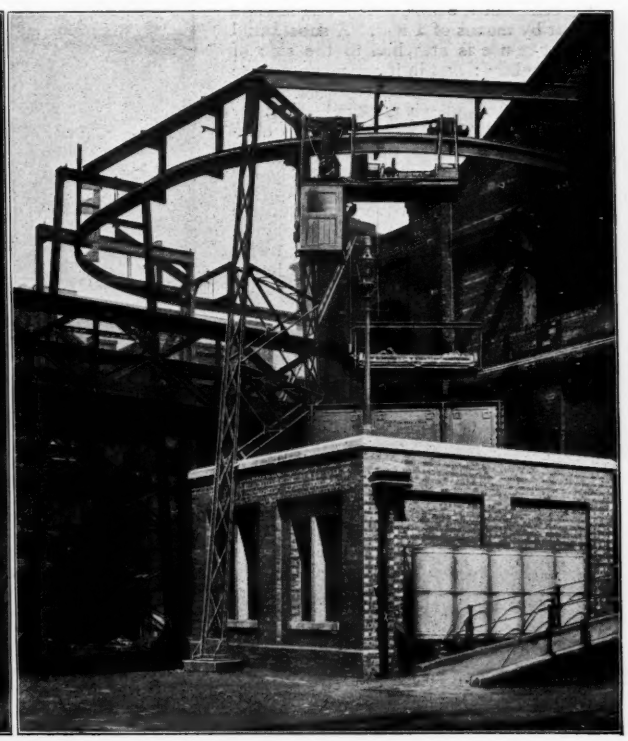
The telpher track runs straight through the retort-house, and at the ends is curved, with a radius of about 30 feet, and runs parallel to the house on the outside over the railway siding; the total length being 622 feet. The track is of the single mono-rail design; the track joist being 15 inches by 5 inches in section, and equipped with a very effective stiffener in the form of a channel mounted on the top of the track joist. On the top of the channel itself is fixed, by means of hook bolts, the renewable track rail. This track appears to be exceptionally stiff, and there is no apparent vibration due to the travel of the telpher.

The height of the track above the ground is 43 feet. It is supported outside the house by very substantial lattice braced steel trestles, arranged at every 25 feet. Inside the house, the track is attached to long lattice struts, which are carried up from the stage-floor level to the roof girders, and are tied back on to the cast-iron columns of the house structure. This makes an exceptionally effective fixing, and none of the telpher track or supports are carried from either the retort-bench or the ironwork; so that no part of the telpher track is affected by any distortion in the retort-bench.

Under the telpher track, outside the house, running parallel to

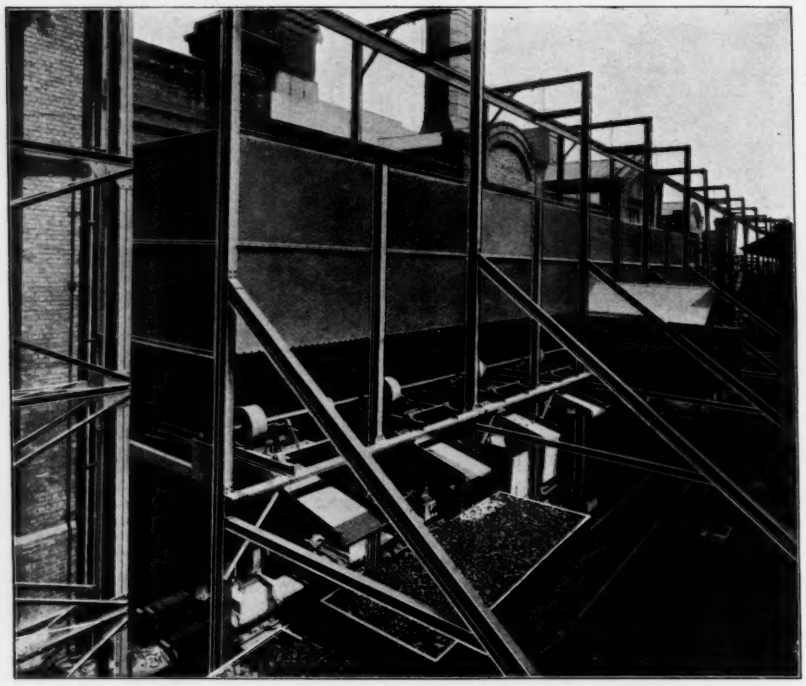


General View of Telpher passing round Curve; also Half of Coke-Hoppers and Screens.



Telpher leaving Retort-House and Lowering Load of Hot Coke into Quenching Tank, placed on Top of Generating House Roof.

the retort-house, is installed a long range of steel coke-bunkers, having a total capacity of about 200 tons. The telpher track runs immediately over these bunkers, which allows of the telpher discharging coke into them. The bunkers are divided into eight sections; each section being provided on the underside with a shaker screen, with suitable feed and driving gear, for screening the coke and discharging the screened material direct into a railway waggon on one siding, while the breeze from the screens is directed into a railway waggon on another siding under the bunkers. Each of the screens has a capacity of about 15 tons of coke per hour. They are driven by belt from one long main shaft running the whole length of the hopper structure. Each screen is provided with a fast-and-loose pulley, so that any screen can be started up or stopped independently of the other. A Siemens 15 H.P. motor is arranged in the centre of the hoppers, driving the line shaft by means of a belt. A substantial motor-house is attached to the side of the bunkers; and in it are mounted the necessary motor, starter (with automatic cut-outs), volt-meter, pilot lights, &c.



General View of Whole Range of Coke-Hoppers, with Shaker Screens, Driving Gear, &c.

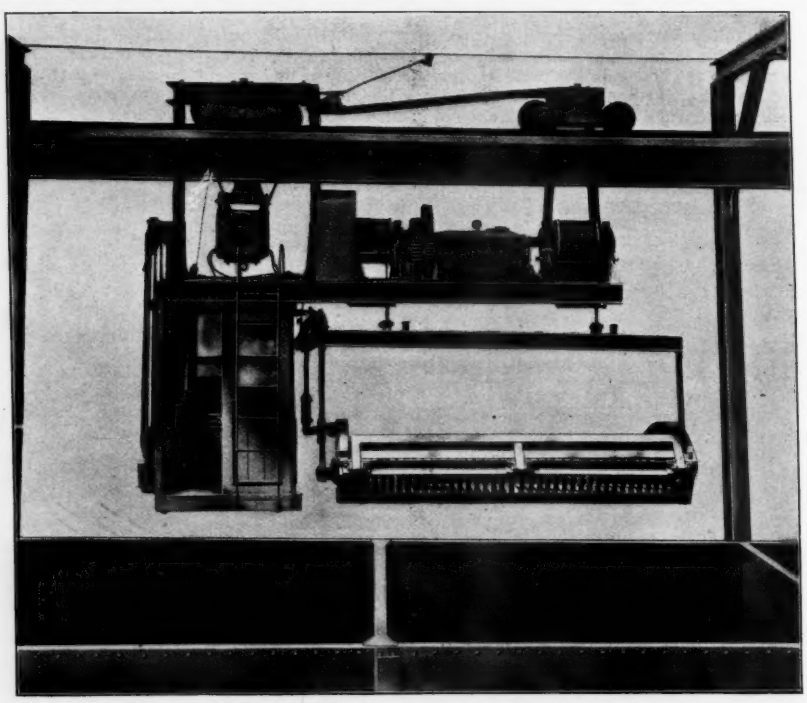
The track is equipped with two electric telphers. It was intended that each telpher should deal with one half of the house. Since the plant has been started up, however, and the drivers have become experts in the handling of the machines, it is found that one telpher can deal with the whole of the coke from the house as fast as the machine pusher can conveniently discharge it. The second telpher is thus actually acting as a stand-by. Each of the telphers is capable of hoisting a gross load of 30 cwt., at a speed of 80 feet per minute, and travels fully loaded at a speed of 500 feet per minute. The telphers are of Messrs. Brooks and Dempster's patent swivel-bogie design, specially arranged for easily travelling on curves.

The hoisting gear drum is driven by means of a Siemens "C" type motor, through suitable steel reduction gear; and the travelling wheels are driven by means of a similar motor mounted on a cast-steel bracket attached to the swivelling bogie. The swivel bogies are so arranged that a rigid frame carrying the whole of the gear is pivoted on the top and in the centre. The bogies are free to turn on the centre for travelling on curves, and also to rock laterally, which ensures the driving wheels always being in close contact with the track, so that each of the driving wheels takes its exact proportion of the weight on the centre bogie, ensuring the wear on each wheel being the same. This is important, seeing that both the travelling wheels are driven by means of single triangular chain drive, so that it is necessary that the circumference of each wheel should always be exactly the same.

The telphers are provided with practically smoke-tight cabins for the driver; the cabins being provided with sliding doors and windows. The whole of the operations of the machine are controlled by the driver from his cabin; and a substantial cluster of electric lights is mounted on the front of the machine to facilitate working at night-time.

The telphers are readily worked by the average labourer. The coke is handled by a number of lattice steel coke skips, each skip having a capacity of about 16 cwt. of coke. All the skips are fitted with steel trunnions at each end for engaging with the lifting hooks of the telpher, and are also arranged with a simple tipping catch, which can be disengaged by the telpher driver with the skip at any position—the skips being so balanced that they are self-tipping when full and self-righting when empty.

Two cast-iron quenching tanks, mounted on steel framework, are provided and fixed under the telpher track—one at each end of the retort-house. These tanks are fitted with a false bottom grid, which can be lifted up by the telpher occasionally to clear the tank of any coke that may have collected in the bottom when quenching the hot coke in the skips. The skips are of sufficient length so that each skip can deal with three retorts in line. The skip of hot coke is lifted from the stage floor close up to the track. The telpher driver then travels outside, lowers the skip into the quenching tank, and, after the coke has been quenched, the skip is hoisted and conveyed to the coke-hoppers and there discharged. A complete trip from the retort-house to the hoppers and back to the retort-house takes from 2½ to 3 minutes. Practically the whole of the coke handling is done by the telpher driver only, with the exception of the men who attend to the doors, who have also to swing the skip into position just before it comes to rest on the floor, and engage and disengage the telpher lifting hooks.



One of the Electric Telphers Brooks and Dempster's Patent Swivel-Bogie Type).

For providing current for the telphers a complete generating set is installed. This consists of a gas-engine direct coupled to a Siemens 13 K.W. compound-wound generator, which, besides providing current for the two telphers and screening plant, has a considerable margin for providing current for the coal plant, &c.

The whole of the work was designed and carried out by Messrs. Robert Dempster and Sons, Limited, of Elland, in accordance with the scheme prepared by Mr. Thomas Hardie, the Engineer of the Newcastle-on-Tyne and Gateshead Gas Company.

THE NEW VIENNA CORPORATION GAS-WORKS AT LEOPOLDAU.

Since Nov. 1, 1899, the supply of gas to twelve districts or divisions of the City of Vienna has been in the hands of the Municipality, and has been undertaken from the gas-works at Simmering, which were completed in that year. The gas supply of the remaining ten districts of the City has been shared by the Imperial Continental Gas Association and the Austrian Gas Lighting Company. From Jan. 1 last, however, the supply of these districts also has been taken over by the Corporation, who have erected new gas-works at Leopoldau and have extended the plant at the Simmering works in order to provide the required quantity of gas.

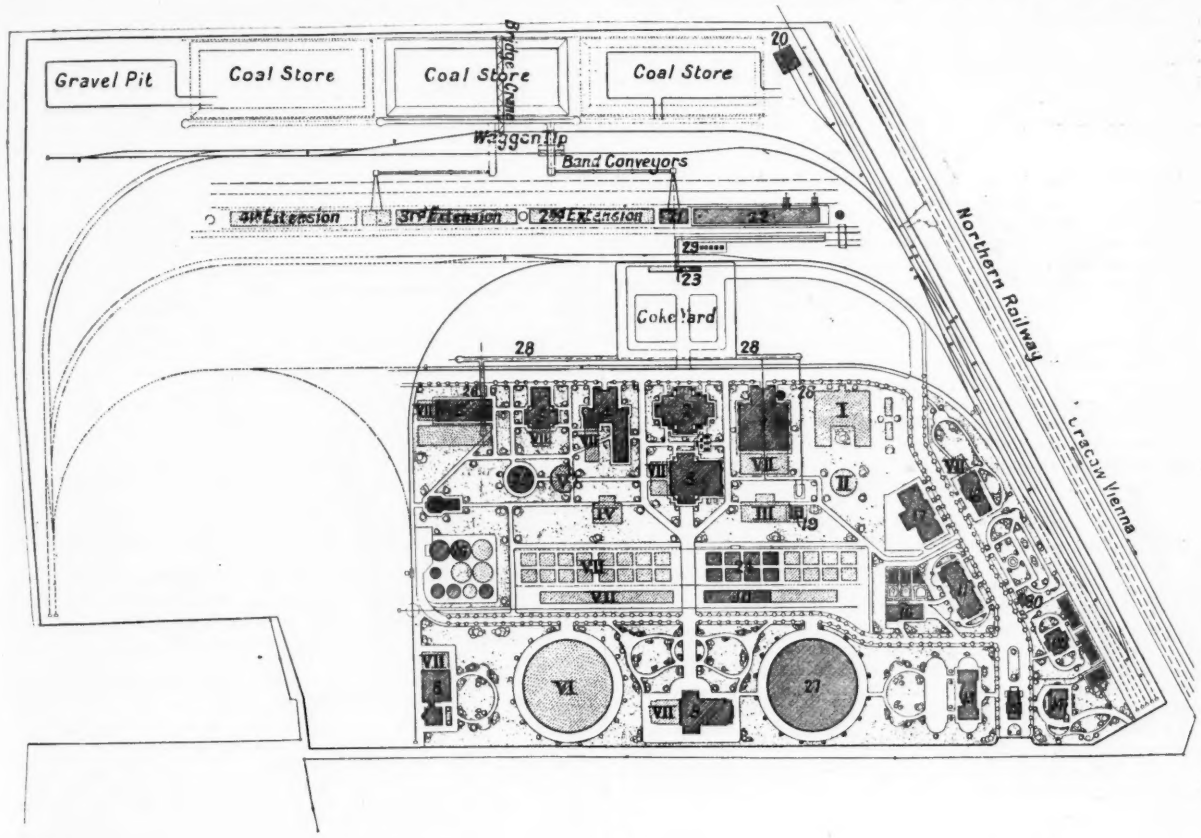
It was estimated that 6350 million cubic feet of gas would be needed for the supply of the whole of Vienna in the present year. The Simmering works had originally been equipped for a maximum make of 15¼ million cubic feet per diem, which corresponds with an annual output of about 3035 million cubic feet. These works could not, without introducing objectionable features, be enlarged to give a higher make than 27 million cubic feet per diem, or an output of about 5295 millions per annum. Consequently, the erection of a second Corporation gas-works had become imperative; and after some delay, the constructional work was actually started in the latter half of the year 1909. These works, with an initial productive capacity of nearly 9 million cubic feet per diem, are situated to the north-east of the City, in the XXI., or Leopoldau district. They adjoin the Northern Railway, which connects Vienna with the Karwin-Ostrau coalfields. An account of the new works has been published in a recent number of the "Zeitschrift des Vereines der Gas- und Wasserfachmänner in Oesterreich-Ungarn," from which source the following particulars are taken.

Area of Site and Capacity of Works.

The site comprises about 110 acres, of which some three-fifths is covered by the works now erected, and has been chosen on account of its level and position, which is close to the district to be supplied. The subsoil is gravel and sand; and the land was obtainable at a comparatively low price. The plans have been made with a view to the ultimate extension of the works to a productive capacity of 35 million cubic feet per diem, or an annual output of about 7000 millions.

Coal Handling.

Coal is drawn in trucks from the depôt of the Northern Railway, about three-quarters of a mile away, on to the sidings of the southern part of the works. From these sidings lines lead to the coal and coke stores, the tar-tanks, purifying plant, and sulphate



1 Boiler-house.
2 Exhauster-house.
3 Washer-house.
4 Recreation building.
5 Engine-house.
6 Producer-plant.
7 Pumping-house.
8 Ammonia works.
9 Meter-house.
10 Purifying material sheds.
11 Offices.
12 Assistants' dwelling house.
13 Foreman's dwelling house.
14 Works' Superintendents' dwelling house.
15 Porter's house.
16 Canteen.
17 Workshops.
18 Store.
19 Switch-house.
20 Locomotive shed.
21 Coal-store.
22 Chamber settings.
23 Coke screening plant.
24 Purifying plant.
25 Producer-gas holder.
26 Tar and ammonia tanks.
27 Gasholder.
28 Electric telpher line.
29 Condensing plant.
30 Sewage pumping plant.

Extensions provided for.

I. Water-gas plant.
II. Water-gas holder and oil-tank.
III. Electric power station.
IV. Laboratory.
V. Producer-gas holder.
VI. Gasholder.
VII. Extensions of buildings.

PLAN OF THE LEOPOLDAU (VIENNA) NEW GAS-WORKS.

works. There are provided for haulage between the depôt and the sidings and on the works, two three-axle three-wheels-coupled tank-engines. Two waggon-tips, each capable of handling 90 tons per hour, discharge the coal into a pit. These tips are adapted for either end or side tipping waggons. The coal is raised from the pit into bunkers above four coal-breakers by means of two inclined elevators, each capable of dealing with 90 tons an hour. The coal is broken to the size of nuts, and is then carried up by two Robins band conveyors, each 395 feet in length, to the reinforced concrete coal-tower, which holds 1440 tons. The coal which is not required for carbonization immediately on arrival is conveyed by the inclined elevators over the bunkers into electric telpher cars, which run to a bridge crane, with a span of 197 feet, which traverses the coal-store, by which they can be discharged at any point of the latter. The coal is picked up from the store, when required for use, by means of grabs, worked by a travelling and revolving crane on the bridge, and put into the telpher cars by which it is conveyed to the coal-breakers. Dust removers draw away the dust which is produced by the discharging of the coal.

Carbonizing Chamber Settings.

Adjoining the coal-tower is the installation of settings of horizontal carbonizing chambers. This installation comprises 72 chambers, each 32·8 feet long, 20 inches wide, and 7 feet high.

A charge for one of the chambers amounts to 11 tons of coal. Nine chambers are comprised in one bench. The chambers are heated with producer gas, which is made in a central producer installation at a distance from the settings. The gas is conveyed through two cast-iron mains of 28 inches diameter and 1150 feet in length to the settings. The producer plant consists of twelve Kerpely producers with revolving grates. [See "JOURNAL," Vol. CXVIII., p. 231.] They are charged with small coke, and the clinkering is effected automatically by the revolving grate. The producer gas is drawn by fans from the producers and freed from dust and particles of tar, and cooled by washing in disintegrators. It then passes to the settings. The producers have cooling jackets, which prevent the caking of the clinker on their walls. These jackets serve as boilers, which supply the whole of the steam required for working the fans, disintegrators, and pumps, and for the producers. There is further a surplus of steam available for use in the ammonia works.

The producer gas and the air required for combustion are passed through heat economizers, in which they are heated to a high temperature. These economizers are spaces beneath the chambers packed with fire-brick chequer-work. The flue gases which have heated the walls of the chambers pass through these economizers before being led away to the chimney, and impart the greater part of their heat to the chequer-work. This utilization of the heat of the flue gases greatly diminishes the consumption of producer gas, and consequently of coke for heating. The fuel consumption for heating the chambers is thus smaller than with other settings. The chambers are charged by hopper waggons, driven by electricity, which pass under the coal-tower and on top of the settings. Each waggon contains the whole 11 tons of coal for charging one chamber; but the charge is put in through three mouthpieces in the top of each chamber. The chambers are heated to a temperature of about 1300° C. (= about 2370° Fahr.) and the coal is completely carbonized in 23 hours.

Coke Handling.

The self-sealing doors at the ends of the chambers are opened when the charges are worked off, and the block of coke, weighing about 7½ tons, is expelled by a discharging machine which travels in front of the setting, and is quenched in waggons, which, like the discharging machine, are worked by electric power. After quenching the coke is delivered on to an endless bucket-conveyor, which passes along the back of the settings, and is taken by it to the coke breaking and sorting plant. This conveyor can deal with 150 tons of coke in an hour. The coke plant, in a reinforced concrete building, comprises two sets of breaking and sorting apparatus, each of a capacity of 60 tons per hour, by which the coke is reduced to suitable size for sale. The sorted coke passes into a bunker, divided into compartments for the different sizes, and from this waggons and sacks are filled, or it is taken by a telpher line to the coke yard, or to the boiler-house or producer installation. The coke is thus handled throughout by machinery.

Exhausters, Condensers, &c.

The gas is drawn from the carbonizing chambers by means of four sets of exhausters placed in a separate building; each set having a capacity of about 5 million cubic feet per twenty-four hours. Between the carbonizing chambers and the exhausters it passes through four water-cooled tubular condensers, standing in the open; each having a cooling surface of 5490 square feet. These cool the gas to 60° to 70° Fahr.; and the greater part of the tar and liquor are separated from it in them. The exhausters force the gas through the purifying plant and station meters to the holder. Each set of exhausting plant consists of two four-blade exhausters, coupled to steam-engines; each unit having a capacity of 106,000 cubic feet per hour. The steam-engines have centrifugal governors, and Hahn's gas-governors.

Washers and Tar-Extractors.

The washing plant, in a separate building, comprises three Pelouze tar-extractors, each of a capacity of 3½ million cubic feet in twenty-four hours, and three rotary washers, of the same capacity, for the extraction of both naphthalene and ammonia. The washers are divided into two distinct parts for naphthalene and ammonia respectively; but the drums are mounted on the same shaft, which is driven by a steam-engine at the end of the naphthalene section. There are four compartments in the naphthalene and six in the ammonia section.

Purifiers.

The purifiers stand in the open. They consist of eight cast-iron vessels, each 30 feet by 40 feet inside, with an extreme height of 7 ft. 6 in. There are six tiers of grids. The gas enters the inlet side, both at the top and bottom, and passes into the middle, where there is a clear space, 14 inches deep, which is in communication with the outlet. The side plates of the purifiers have cast on them cups giving a water-seal of 36 inches. Hydraulic change-over valves are provided. The purifiers are sunk in the ground, and provision is made for heating the pits in which they stand. The lids, which are above the ground-level, are jacketed with insulating material. A jack crane, travelling the whole length of the purifying plant, and having a span of 88 ft. 6 in., serves for raising the lids of the vessels and for handling the purifying material. An electric telpher line traverses this crane. A detached valve-house controls the purifier valves.

Meter-House.

The meter-house contains three station meters, with duplex drums, each for a capacity of about 4½ million cubic feet per diem. The gas then passes into a holder of about 5¼ million cubic feet capacity. In the meter-house there are also an air-blower, of 350,000 cubic feet per diem capacity, which provides the air which is mixed with the gas before it enters the purifiers; an air-meter; and a governor and meter for the gas used on the works. There is besides a turbo-blower, driven by a 250 H.P. steam-turbine. This blower draws the gas from the holder, and forces it through a steel main (welded by water gas), 29 inches in diameter, into a gasholder of 9 million cubic feet capacity, situated in the XXth district of the city, at a distance of 3¾ miles from the Leopoldau works. The blower, at a pressure of 67 inches of water, transmits 900,000 cubic feet of gas per hour. From this holder the gas passes through governors to the distributing system.

Works Mains.

The carbonizing plant is connected with the condensers, exhausters, washers, purifiers, and station meters by two sets of works mains, which will be large enough for the make of gas when the plant is extended to a productive capacity of 17½ million cubic feet per diem. Each set of connections has, as far as the exhausters, a diameter of 40 inches, and thence onwards a diameter of 36 inches. The connections to the 5¼ million cubic feet gasholder and to the inlet of the turbo-blower are 48 inches in diameter.

Boiler-House.

The boiler-house, which supplies the steam for the exhausters, washers, steam-engines, turbo-blower, tar-pumps, and for steam-heating, contains six water-tube boilers, of the Babcock and Wilcox type, each having a heating surface of 2422 square feet, and with superheaters of 549 square feet of surface. The pressure at which they work is 12 atmospheres. They are stoked and clinkered automatically by step-grates of the Pluto-Stoker pattern. The fuel used is coke breeze, up to ⅝ inch in size, which is brought by a telpher line from the coke-sorting plant. The water for works' use is pumped by means of four sets of centrifugal pumps, which are coupled directly to electro-motors. Each set pumps 880 gallons of water a minute, at a pressure of 3 to 4 atmospheres. An electric-hydraulic regulator, on the Delphin system, controls the quantity of water pumped, according to requirements; and thus the customary water-tower has been dispensed with. In case of fire, two pumps may be worked in series, and a pressure of nine atmospheres obtained. This would suffice to reach the highest objects on the works. The water supply is taken from two wells. The current required is obtained from the Corporation electricity works, as high-tension alternating current, and is transformed on the works from 5000 to 220 volts. Tar and liquor are stored in tanks above ground, constructed on the Intze system.

Weighing and Recording Apparatus.

The coal carbonized and the coke used are weighed automatically in self-registering machines, and the steam, current, and water consumed are also measured by recording apparatus, so as to maintain constant effective control over the works' operations.

Improved Hygienic Conditions—Reduced Labour.

The abolition of night work on the carbonizing plant, which only requires a little supervision at night time, and the fact that the carbonizing work and purifying work are both done in the open, make the hygienic conditions much better for the men than at other gas-works. The welfare of the employees has also been cared for by the provision of bath, rest, and dining rooms of the most modern type. An office block, houses for officers and foremen, workshops, and stores complete the works' equipment. All the buildings have toned façades, and red asbestos tiled roofs, and, with the flower-beds and trees which have been planted, give the works a very pleasing appearance. The machinery provided throughout has reduced the number of hands required to a minimum—at present 150 men are employed; but on a further extension of the works, this number will not be greatly increased. The works were completed in less than 2½ years, and started operations on Dec. 17 last.

Répertoire des Industries Gaz et Electricité.

We have just received a copy of this French work for the current year. The contents occupy 840 pages (4½ in. by 7 in.), compared with 770 pages in its immediate predecessor. They furnish particulars of special utility to manufacturers of gas plant, directors of gas companies, electricians, plumbers, and gas-fitters—indeed, all who are interested in the gas and electricity industries. In the section of the book devoted to gas will be found an alphabetical list of companies and the towns served by them, together with their capital, offices, directors, engineers, managers, and the names of the plumbers within their area. In the electricity section, the stations and sub-stations are grouped alphabetically; and, in addition to technical particulars, others are given similar to those relating to gas companies. The gas and electricity stations are also grouped according to departments. Altogether, the book presents a valuable collection of information. It has been produced under the supervision of M. Maurice Germain, the Editor of the "Journal de l'Eclairage au Gaz et à l'Electricité," from the office of which publication (No. 7, Rue Geoffroy-Marie, Paris) it is issued at the price of 4 frs. for places outside France.

INTERCHANGEABILITY OF STREET LANTERN PARTS.

The Podmore System of Construction.

In these days of high-power lighting, by both high and low pressure gas, it is plain the lamps used for this purpose must have greater resisting powers than in the days of low-power lighting; and it is equally clear that there is greater necessity now for lamps being constructed so that all parts that are likely to be affected can, when the time comes for renewal, be promptly replaced *in situ*. Lamp makers have thus two special structural points to consider in connection with lanterns suitable to present-day requirements.

Structural Improvements in Top Interior Parts.

The point was raised by Mr. P. J. Fitzpatrick in the paper he read before the Irish Association last month. He made a very general attack on modern forms of lantern construction when he said that high-power inverted lamps for ordinary pressure leave considerable room for improvement in construction, to withstand the combined corrosive action of heated products of combustion and our generally humid atmosphere. He particularly instanced the corrosion of the flues, and spoke of the fact that makers supply renewal parts, and of the objection that users have to pay for them after using the lamp a season or two. He then suggested that heavy inverted lamps ought to be made in copper, with cast-iron enamelled flue linings.

The Interchangeable Lantern Complete.

The Same Lantern with Top Packed Inside, ready for Transmission.

These strictures by Mr. Fitzpatrick attracted the notice of Messrs. A. E. Podmore and Co., of Charles Street, E.C.; and they invited a representative to call and inspect for himself what they have been doing to meet the troubles of which Mr. Fitzpatrick complained. Of course, street lamps like all other things that render service, and are exposed to atmospheric and other influences, will wear out, so that part renewals must be expected, and rather more frequently now than before, though not at such short intervals as Mr. Fitzpatrick has experienced. As to his suggestions, Messrs. Podmore say that they have always built their high-power lamps of copper. But, from their long experience, they must dissent from his suggestion regarding cast-iron enamelled flue linings; and for the reason that the expansion and contraction of the iron has the effect of causing numerous, at first almost imperceptible, but gradually enlarging, cracks in the enamel. The water vapour from the combustion of the gas has a tendency to get into these cracks, progressive rusting is set up, the adhesion of the enamel to the iron is impaired, and the state of the cast-iron enamelled flues becomes such that the less said about them the better. Experience has taught the firm that the best way to deal with the flues is to make them wholly of aluminium or copper coated with a special preparation of aluminium. The firm are taking a great interest in the use of aluminium in street lanterns. It is light, and lessens weight in large consignments; and, where lanterns have to travel a long distance, this is a point for consideration. But an important thing is its resisting power in relation to deterioration by the products of combustion. We saw a three-light 500-candle power lamp, with an inner cone and chimney of aluminium, that had been burning for three months, ten hours a day; and the products of combustion had not had any perceptible effect upon the aluminium as they would have had on enamelled iron in those parts or upon plain copper. Unless copper, used for inner cones or chimneys in the head of the lantern, has a preservative coating of aluminium paint, when the products play on the copper, microscopic examination shows that the metal is attacked, and lamination set up, so that the copper gradually wastes away. The aluminium coating prevents this. But it is no use talking about a lamp that will not wear out—all the precautions in the world will not prevent this. The maker can do his part in prolonging life; and what the customer has to do is to see that new lanterns for high-power work are so constructed that the parts can be cheaply and conveniently renewed.

Interchangeable Parts.

Interchangeability of parts has been a matter that the firm has been studying in detail; and a couple of new lamps that they have designed and patented were expeditiously taken completely to pieces, and the interchangeability of parts demonstrated—thus admitting of any part being renewed *in situ*, without having to dispatch the whole lantern to the makers for repair. There is the square topped (insect proof) lantern. The top is hinged; and, by the removal of a hinge rod, it can be lifted entirely off. The outer top cone can be removed by taking out four screws. The inner top flue-pipe is likewise removable. The raising of the hinged top of the lamp exposes the burner, the cone over the inverted burner which slides into the inner chimney flue, and the top of the reflector. The cone can be quickly taken out. The bunsen tube of the burner is formed with a long spigot and socket, and so can also be readily removed. The reflector can be lifted out. And all this detachment of parts is accomplished in the minute or two occupied by the explanation of how it is done. Even the gas-supply pipe inside the burner has a nut and screw joint, so that it can be taken apart. Nothing simpler can be required in a lantern the parts of which are interchangeable.

Interchangeability does not end with replacement of the same parts; but there is a choice of design of top that can be applied to the same lamp body—one being a bayonet-jointed head, so that, by a single turn of a thumb-screw, it can be removed. So long as there is a frame in good condition, the lamp at any time can be brought up to date. Further, these lamps that are so easily taken apart and fitted together again are very convenient for transport, for the parts can be packed one within the other, and so occupy very small space. This is shown by the accompanying illustrations, which portray a lamp completely fitted, and the same lamp packed ready for transmission to its destination. There is just one point about the air admission to the head of the lamp for the supply of the burner. It is taken in at the top through a perforated band; and its course is so directed that it impinges on the outer side of the chimney flue, and is thus preheated before being used as primary or secondary air supply. Another point is that for these four-ribbed lamps different-shaped reflectors are made. One new reflector of a strong, deep type is glazed with iron stone porcelain, and provision is made in it for the suspension of inner glass cylinders if required.

A noble-looking pedestal high-power lamp for outdoor lighting has also been designed to admit of equal interchangeability and renewal *in situ*. By simply taking off the top knob, and removing a single screw, the whole of the top can be lifted off, and the burners exposed to view. Every detail of this heavy lamp can be renewed without dismounting it. In this and other lamps, we see how the aluminium chimney, or aluminium-painted copper chimney, has been employed. In other lamps, too, we find aluminium used in the interiors where the polished surfaces have value in contributing to reflection.

A Burner with a Large Range of Application.

The inverted burner fitted to these various lamps has a large range of application; so that, by very simple changes, if it is desired to increase or decrease the lighting power and consumption of a lamp, it can readily be done, without removing the entire burner. The same burner was seen working with a consumption of 2½ cubic feet and 4½ and more cubic feet, with different sized mantles, ranging from 30 mm. to 54 mm. in length, and in each case the mantles were fully and highly incandescent. This burner has been found of considerable value in the lamps supplied by the firm. It is of the bent tube type (patented in 1908); and it has been so designed as to permit of a standard construction, parts of which are adjustable, and parts interchangeable, in order to allow of adjustment to compensate for variations in the quality and pressure of the gas in different districts. The burner will permit of different nipples and nozzles being employed for mantles of different sizes. With information as to the quality and pressure of the gas in a district, the firm can fit the correct nipple so that no other regulation of the gas supply to the lamp is needed. The internally screwed socket which fits on to the gas-supply pipe is made cylindrical so as to fit into the interior of the air chamber; and the other end of the chamber is made cylindrical, or slightly taper, to form a spigot to project more or less into the bent burner tube. The air-chamber may be provided, if desired, with an ordinary perforated sleeve for the regulation of the admission of the air, or interchangeable air-chambers with spigots of different sizes may be employed. With this construction of burner, the length of the bunsen-tube may be varied at will, and the sharpness of the flow of the mixture increased or reduced. There are other variations which enable the burner (which is made of strong cast brass) to be applied to all situations. From these several points, it will be seen that the firm have developed a series of up-to-date street lanterns, the proper maintenance of which will be a matter of ease and economy.

SOUTH-WEST OF ENGLAND ASSOCIATION OF GAS MANAGERS.

Annual Meeting at Ilfracombe.

The Annual Meeting of the South-West of England Association of Gas Managers was held on the 27th ult. at Ilfracombe, where the President (Mr. James Armstrong) is the Engineer and Manager of the Gas Company. The proceedings were mainly of a social character; and a very enjoyable day was spent. At the Company's offices, an able address on the local gas undertaking was given by the President, who also explained in detail the tar dehydrating plant recently put down for the Urban District Council. Several questions were put and answered; and it was agreed that the meeting had proved most instructive.

The members were afterwards entertained at luncheon by the Chairman and Directors of the Gas Company. The Chairman (Mr. W. C. Rafarel) proposed "The South-West of England Association of Gas Managers;" and, in responding, the President referred to the greatly increased use locally of gas tar for spraying roads. The toast of "The Town and Prosperity of Ilfracombe" was submitted by Mr. A. S. Brook (the Hon. Secretary of the Association). The Chairman of the Ilfracombe Urban District Council (Mr. G. C. Jones, J.P.) replied, and spoke of the remarkable progress made by the local gas undertaking. He said he well remembered the time when it was carried on by an old gentleman and his two sons, who did the whole of the work. The price of gas was then 12s. per 1000 cubic feet; now it was 3s. 6d., and a further reduction had been promised.

After luncheon, the gas-works were inspected; and a trip was subsequently made to Combe Martin. Before dispersing, the party had tea, at the invitation of the President.

STREAM POLLUTION BY SPENT GAS LIQUOR.

Before the Industrial Hygiene Section of the Royal Sanitary Institute Congress at York, last Wednesday, Dr. H. MACLEAN WILSON, the Chief Inspector of the West Riding Rivers Board, read a paper on "The Pollution of Streams by Spent Gas Liquor." In the course of his lengthy paper, the author made the following remarks.

In the manufacture of gas, large quantities of gas liquor are produced. It was at first looked upon entirely as trade refuse. But its treatment for the recovery of the ammonia it contains was soon undertaken; and this ammonia now yields very considerable profit. The works at which ammoniacal liquor is produced or dealt with are either ordinary gas-works or the premises of chemical manufacturers, patent coke-ovens, blast-furnaces, shale-oil works, or in works where gas-producers have been installed. The increase in the quantity of gas liquor produced, which has been very great in recent years, and will be still greater in the immediate future, is little dependent upon the manufacture of gas for illuminating purposes, but is due first to more economical methods of manufacturing coke, in which the gases which were formerly burned to waste are now recovered and treated for the separation of ammonia and other bye-products, and, secondly, to the increasing manufacture of gas to be used both as fuel for boilers and directly for power production in gas-engines.

Gas liquor, whether obtained from the manufacture of gas in gas-works or as a bye-product from other processes, contains ammonia in two forms—free, and fixed in combination with acids. This ammonia is recovered by distillation in two stages; the liquor being first heated by itself, by means of live steam, when the free ammonia and a certain amount of volatile ammonium salts escape, and afterwards with the addition of lime, which sets free the ammonia which has been combined with the stronger acids. The gas liquor from blast-furnaces and shale-oil works contains so little fixed ammonia that it is generally distilled without the aid of lime. The ammonia escaping from the still is passed into strong sulphuric acid in a saturator, where it is seized upon by the acid to form crystals of sulphate of ammonia.

The hot vapours which pass from the still through the acid are cooled and condensed in a series of pipes into a grossly polluting liquid which is known as "devil water." This liquor is sometimes discharged as refuse, but is generally, and should be always, returned to the storage tank for gas liquor, and circulated again through the still. The bulk of the refuse, however, comes from the still—being the spent gas liquor after the ammonia has been driven off, along with the lime which has been added in the process of distillation. Modern stills are always so constructed that the crude gas liquor is continuously entering at the top, and the spent liquor, with the spent lime, escaping at the bottom. Other subsidiary polluting discharges—such as occur from leaky pipes, surface drainage, and the spilling of tar and oils—are only small in amount, and can readily be prevented.

One such subsidiary discharge in the case of some patent coke-ovens may be specially mentioned. The gas, after passing through the washers where the ammonia is dissolved out by water, is very rich in benzol, which forms another valuable bye-product. This is extracted by passing the gas through a scrubber in which tar oils (creosote) are used instead of water, because benzol is soluble in the former, but not in the latter. This solution of benzol in creosote is distilled like the gas liquor, first with the aid of a current of live steam, and finally by means of heat applied by a steam-coil, which drives over the benzol mixed with the vapour of water. These in condensing separate into two layers—an upper of benzol and a lower of water; and the water, though fairly bright and clear, is still grossly polluting, and quite unfit to discharge into a stream. It contains, however, a considerable amount of ammonia, and can with advantage be run into the gas-liquor tank, as is done in some cases, or can be used for the absorption of further ammonia in the washers. The tar-oils from which the benzol has been distilled are re-used for the absorption of more benzol, and are too valuable to be discharged as liquid refuse. When they become too highly charged with impurities to be fit for re-use, they are sent to the tar-distillers for re-distillation.

The spent gas liquor leaving the ammonia stills is a light brown liquid, of a temperature of some 100° C., turbid with particles of spent lime and tarry matters, and having a peculiarly offensive smell. From the presence of the lime, it is strongly alkaline and exceedingly hard. Most of the lime settles readily, leaving a comparatively clear liquid, the chemical composition of which is somewhat complex. It is sufficient for the purpose of showing its polluting character to say that it still has a brown colour and an offensive smell, and contains large amounts of acid and basic tar oils and noxious sulphur compounds, that the oxygen it absorbs in the permanganate test is exceedingly high, and the hardness, partly temporary but chiefly permanent, very marked.

The effect of a discharge like this upon a small stream is disastrous; the water being rendered poisonous to fish and cattle, offensive and discoloured, and unfit, in fact, for any of its ordinary uses. Moreover, the great capacity of the refuse for absorbing oxygen is very detrimental to the stream in preventing the self-purification going on in all streams under natural conditions.

As a guide to the amount of spent gas liquor produced in the distillation of coal, the following figures, estimated on the dry coal converted into coke in coke-ovens, may be given:—

Water of combustion .	4–6	per cent., or	9–14 gallons per ton.
Moisture in coal. . .	10–15	,,	,, 22–33 ,,
Water from scrubbers .	15–20	,,	,, 33–45 ,,
Steam for distillation .	8–10	,,	,, 18–22 ,,
Lime water added to stills	10	,,	,, 22 ,,
Total . .	47–61	per cent., or	104–136 gallons per ton.

Thus a battery of forty coke-ovens, turning into coke some 200 tons of coal per day, will roughly yield 20,000 gallons of spent gas liquor per day.

The purification of this kind of refuse has been a problem difficult to solve. It is easy, by the use of simple settling tanks, to get rid of suspended solids; but these, though objectionable, are innocuous compared with the matters in solution. It has been shown by Mr. Gilbert Fowler, D.Sc., F.I.C., that the liquid, when diluted, is amenable to treatment on biological filters. He has constructed a percolating filter of somewhat coarse material, 9 feet deep, and prepared it either by using material which had previously formed part of a sewage filter or by ripening the filter by the application of a weak sewage until nitrification was induced. To such a filter he has applied the spent liquor from gas-works—clarified by settlement, and diluted to ten times its original volume either with clean water or with the filter effluent—at the rate of 100 gallons of the dilute liquid per square yard per day. This treatment effects a very marked reduction in the oxygen absorbed figure, while the sulphocyanides and phenols are also greatly reduced. Dr. Fowler has succeeded in isolating a special organism which apparently has the power of oxydizing phenol. Bacteriological examination shows that although, as might be expected, the spent liquor coming from the stills is sterile, the effluent from the filter teems with bacterial life—sometimes containing as many as 320,000 bacteria per c.c.

The cost of carrying out this process is considerable; 2 to 3 cubic yards of filtering material being required for every 10 gallons of the crude refuse produced daily. Thus, for a battery of forty ovens yielding 20,000 gallons of spent liquor daily, nearly half an acre of filter 6 to 9 feet deep would be required; and even after this purification, which is greater than has been attained by any other process, the liquid would still deleteriously affect a pure stream of small volume. It could, however, be used for many colliery purposes—such as coke quenching and coal washing.

Mr. J. Radcliffe, of Barnet, has introduced two methods, one of which is in operation at Sutton and the other at Enfield, for the partial purification of spent gas liquor, so that it can be received into the public sewers without upsetting the sewage treatment. He claims that, by his latest method, he can remove all solids in suspension, all free lime, all hydrocyanic acid, 70 per cent. of the sulphocyanides, 60 per cent. of the solids in solution, and can reduce the oxygen-absorbed figure by 75 per cent. Fortunately, though methods of purifying this kind of refuse are few and somewhat expensive, there are various ways, especially at collieries, in which it may be disposed of so that it does not reach a stream. In several cases it has been discharged into old pit-workings, where it becomes mixed with large volumes of underground water, and either cannot be traced to its point of discharge to a stream or else is so diluted that its effect on the stream is negligible. Where the colliery spoil-bank is sufficiently large, and more especially where it is burning, the refuse has been effectively disposed of by passing it into trenches on the top of the spoil-bank. This method has been adopted with great success at

some of the shale-oil works in Scotland. The spent shale, taken hot from the retorts, is piled up to a great height in "bings," or spoil-banks, and makes an excellent filtering medium. This treatment, partly evaporation and partly filtration, gives really excellent results.

But every colliery has not a disused pit-shaft or burning spoil-bank; and then other means of disposal must be adopted. The spent liquor is used, mixed with other water, for washing coal; but it has sometimes caused trouble in certain types of washer by frothing. At many collieries the refuse is used for slaking or quenching the hot coke as discharged from the ovens. Objections to this course have at times been suggested. It has been said that this use of liquor makes the outer surface of the coke dark in colour, spoils its bloom, and in this way depreciates its value; but, after careful inquiry, the general opinion is found to be that it makes no difference to the users whether the coke has been quenched with spent gas liquor or with clean water. Any objections which were formerly taken to the dark colour were sentimental, and are now rapidly disappearing. The same objections were, in fact, formerly raised with regard to any coke produced in patent coke-ovens, since it is not so bright and lustrous as that produced in the old beehive ovens.

Another suggested objection is, so far as the public are concerned, a much more serious one. It is that such a liquor, when evaporated into the atmosphere, may be injurious, not only to human beings, but to other animals and to vegetation. This would apply with equal force to any method by which the refuse is evaporated, whether on the hot coke, on a burning spoil-bank, or in a special furnace. But careful inquiries fail to show any effect either upon the health of the workers on the spot or upon that of the inhabitants of the country around. The chemical refuse so evaporated produces, no doubt, a certain amount of objectionable smell; but this is altogether insignificant when compared with that produced by the fumes and smoke which are discharged from every battery of coke-ovens or from a burning spoil-bank.

Direct evaporation of the chemical refuse in furnaces of special construction has been adopted in several instances. This method of disposal has been in use at some of the blast-furnaces in Lanarkshire and Ayrshire for many years; the fuel in these cases being the surplus gas from the furnaces, of which there is always a considerable quantity wasted. It has also been brought into use at two collieries—one in the West Riding of Yorkshire, and one in Derbyshire. In both cases the refuse is settled for the removal of suspended lime, and then sprayed into hot furnaces, where it is evaporated and escapes by the chimney, leaving behind only a quantity of sludge, which is carted to the spoil-bank.

The latest developments in coke-oven chemical works seem likely to render superfluous all the foregoing methods of dealing with the gas liquor. At the least, they will reduce the volume and alter the character of the refuse to be dealt with, making the problem much easier. In December, 1908, Mr. A. Victor Kochs read a paper before the Midland Institute of Mining, Civil, and Mechanical Engineers, describing the Koppers new process for the recovery of ammonia from coke-oven gas. Instead of extracting the ammonia by washing the gas with water, it is obtained by passing the gas directly through sulphuric acid in the saturator. The hot gas leaving the hydraulic main is cooled to a temperature of about 30° C., and passed through a tar-extractor, so that the tar and gas liquor are condensed. The gas is then heated to 65° C., and passed at this temperature into the saturator, from which it goes on to the ovens, reaching them at a temperature of 40° C.

The bulk of the ammonia is thus taken up by the acid in the saturator directly from the gas, and there is no water used for scrubbing the gas, and therefore no ammoniacal liquor from this source. But there is still the gas liquor produced from the original moisture of the coal and from combustion, from which the ammonia must be distilled by the aid of live steam and lime. The figures given at one colliery are as follows: The amount of wet coal turned into coke per day is 740 tons, containing 12·5 per cent. of moisture (88 tons); the chemically combined water in the coal is 4·36 per cent. (38 tons). The total possible quantity of ammoniacal liquor is therefore 126 tons; the steam necessary for distillation, 31 tons; the moisture carried on in the gas, 10 tons—giving therefore a total quantity of waste liquor of 126 + 31 − 10 = 147 tons. This amounts to 22 per cent. by weight of the dry coal coked, or 50 gallons per ton. It was stated that in the old process, where the gas is scrubbed, a ton of water per oven per day is required for scrubbing, or in this case 120 tons per day, which would require another 30 tons of steam for its distillation, and would thus increase the amount of waste liquor by 150 tons. By the new process, therefore, the amount of waste liquor would seem to be decreased by over 50 per cent.

If benzol is to be recovered, the gas as it passes from the saturator must again be cooled to 25° or 30° C., and scrubbed with creosote. If it is required for gas-engines or for lighting purposes, it must in some cases be purified by the removal of sulphuretted hydrogen. The liquid produced by this second cooling is not at all like that discharged from an ammonia still. When freed from particles of tar, which easily separate on standing, it is a pale yellow liquid; and as it contains no lime, it can be used, mixed with other water, for coal-washing, coke-quenching, or other colliery purposes.

A further development has been made by the Otto-Hilgenstock Coke-Oven Company, Limited. In their new plant, the hot gases from the hydraulic main pass straight into the sulphate-house, the tar which has condensed in the gas-main being collected in a tar-trap. The rest of the tar is extracted from the gases by a somewhat peculiar method; hot tar being sprayed into the gas in a vessel called a "tar-spray." A little water separates with the tar, and is pumped into the hydraulic main. Any excess contains fixed salts of ammonia, and being small in amount can ultimately be run into the saturator with the acid, or can be evaporated for the recovery of ammonium chloride. The gases leaving the tar-spray are still at a temperature above the dew-point, and the water-vapour is therefore kept from condensing; and without any further cooling the gases are passed through the acid in the saturator, and thence direct to the ovens. A small amount of tar appears in the form of a frothy scum on the acid in the saturator; but this is easily skimmed off. The gases leaving the saturator have a temperature of 85° C.; but, in passing along the gas-main, they become somewhat cooled, and this causes the condensation of a little refuse water.

This refuse, like that produced by cooling the gas in the Koppers process, is not like that from an ammonia still, inasmuch as it contains no lime, nor, because of the high temperature of the gas, does it contain any sulphuretted hydrogen. It can therefore be used, diluted with other water, for any of the ordinary purposes of the colliery, or, being small in amount, can easily be evaporated by spraying it into the chimney of the ovens. In a properly constructed plant, where the gas-mains are short and well protected, there is no need for the condensation of any liquid refuse whatever, and all the moisture can be passed on with the gases to the ovens. As in the Koppers process, if the gas is used in gas-engines or benzol is recovered, the gas must be cooled down to a temperature of 25° or 30° C., at which most of its water vapour condenses, and must be treated as liquid refuse. In one case where this system is in use, and 400 tons of coal are coked daily in sixty regenerative ovens, the gas is cooled for use in a gas-engine, and the liquid refuse produced by condensation amounts to about 1 ton per oven per day, or 13,440 gallons in all.

At another plant where a direct recovery process is adopted, erected by the Simon-Carvès Bye-Product Coke-Oven Construction and Working Company, Limited, there are 28 ovens coking daily 175 tons of coal containing 11·5 per cent. of moisture; and the total amount of liquid refuse is 25 tons per day, 2 tons of which are deposited along with the tar, and the remainder in the process of cooling the gas for benzol recovery. At this place, there is also a sulphate plant on the old system, and the waste liquid from the direct process is pumped to the scrubbers of the old plant.

The economies effected by the new processes are many. The chemical plant is simplified by leaving out the water scrubbers and, in the Otto-Hilgenstock and Simon-Carvès plants, the coolers and ammonia stills. The yield of sulphate is said to be increased by 5 to 10 per cent.; and this is easily explained by the simplification of the plant, and the consequent fewer opportunities for loss of ammonia. In the old process, there is some loss by leakage, but more especially because the ammonia in the gas is not completely absorbed by the water in the scrubbers, and because that in the gas liquor is not completely yielded up in the process of distillation. The quality of the sulphate is also improved, and less acid is required for the absorption of the ammonia, inasmuch as the fixed ammonia salts distilled from the coal do not require to be decomposed with lime and again fixed with acid. Further, the quantity of water required is very greatly reduced, the steam and lime necessary for the ammonia stills in the old system are not required, and there is a considerable saving in the initial cost of the works, as well as in the upkeep.

In some of these newer processes—such as those of Burkheiser, Feld, and Fabry—means are adopted for the recovery of the sulphur from gas and its utilization in the production of sulphate of ammonia; but from none of these further processes is there any liquid refuse discharged.

Next Year's City and Guilds Examinations.

We have received from the Superintendent of the Department of Technology of the City and Guilds of London Institute (Sir Philip Magnus, M.P.) the programme for the session 1912-13. It contains full information in regard to the examinations, including, as usual, a list of the works of reference which candidates are advised to consult while prosecuting their studies. As before, separate examinations will be held in "Gas Engineering," which will include manufacture, and "Gas Supply," including distribution and the various applications of gas. The Examiner in the former subject is Mr. Thomas Glover, of Norwich, and the examination will be held on Saturday, April 19, 1913. Mr. Walter Hole, of Leeds, is Examiner in "Gas Supply;" and candidates will be examined in this subject on April 26. Both dates are a week earlier than this year. In addition to the above-named subjects, examinations will, as hitherto, be held in "Coal-Tar Distillation and Intermediate Products," "Coal-Tar Colouring Matters," "Heating and Ventilation," and "Structural Engineering." Elsewhere in the "JOURNAL" will be found the names of the prize winners in the last examinations, and the subjects on which those for next year will be founded. The programme contains lists of scholarships, exhibitions, and money prizes offered by the City Livery Companies, the money prizes given by the Institute, and the persons registered as qualified teachers. It may be obtained from any bookseller, or from the publisher, Mr. John Murray, Albemarle Street, W., price 9d. net (postage extra).

INSPECTION OF GAS-LIQUOR AND OTHER WORKS UNDER THE ALKALI ACT.

District Inspectors' Reports.

In the two preceding issues of the "JOURNAL," the last annual report of the Chief Inspector under the Alkali Works Regulation Act, 1906 (Mr. W. S. Curphey), has been dealt with. We now give some extracts from the reports of the District Inspectors.

As usual, the first report is by Mr. E. G. Ballard, the District Inspector for Ireland, where there are 63 works, in which 82 processes are carried on. He paid 232 visits and made 109 tests last year. On two occasions, he had to complain, not of the escape of noxious vapours, but of a certain degree of slovenliness in the condition of the plant. In one case, instead of a proper plug in the pipe leading the gases to the purifier, a piece of paper was screwed-up and inserted in the hole. Attention was drawn to this, and a proper iron screw-plug was substituted. In the other case, more attention to the general tidiness of the plant might with advantage have been bestowed. The sulphate works, however, as a rule, are exceedingly well conducted in Ireland, and care is exercised to keep the stills and saturators tidy and in a good state of repair. Taking all the places where sulphate of ammonia is made, the number of works absorbing the sulphuretted hydrogen in oxide of iron is 35; the number burning the sulphuretted hydrogen, 3; those working on the continuous system of distillation are 33; and those working on the intermittent system, 5. The proportion of total liquor distilled by the continuous and intermittent processes was 98·1 and 1·9 per cent. respectively. Products equivalent to 3025 tons of sulphate of ammonia were made during the past year.

In addition to Ireland, Mr. Ballard has under his supervision Cheshire, North Wales, and part of Lancashire. Last year he paid 489 visits, and made 734 tests of chimney and other gases. All the works in the district employ continuous stills in the distillation of the ammoniacal liquor for the manufacture of sulphate. The following are the methods by which the sulphuretted hydrogen is dealt with: By Claus process, 2; by absorption in oxide of iron, 20; by special process, 2; and there is one where no sulphuretted hydrogen is evolved. The proportion of sulphuretted hydrogen treated by the above different processes, in terms of sulphate of ammonia made and percentage of total liquor distilled, is as follows: By Claus process, 5·8; by absorption in oxide of iron, 81·6; precipitated by metallic salts, 12·6.

Reporting upon the North of England district, Mr. E. Morley Fletcher says four new sulphate of ammonia works were registered during the year (making 78 in all); and every works was visited—the number of visits and tests being 671 and 648 respectively. The proportion of sulphate made by the continuous processes was 99·4 per cent. Mr. Fletcher says the recovery of the ammonia by the semi-direct and direct processes continues to increase; and the disposal of the waste liquors associated with the older methods becomes a less troublesome problem.

The progress in the erection of coke-ovens with recovery of bye-products, in place of the older beehive ovens, is an important factor in the industrial development of this district. The annual value of waste products in the form of residuals and heat recovered during the last ten years has increased with remarkable rapidity. The recovery of the ammonia in the form of sulphate last year amounted to a value of over £650,000; and to this must be added the value of the tar and benzol also recovered. Except on a small scale, the sulphur contents of the gases have not been utilized as yet—only about 1000 tons of sulphuric acid having been derived from this source. But further advance in this direction is anticipated.

The amount of surplus gas and heat available can be roughly estimated as capable of developing 80,000 H.P. continuously if used under boilers. A large proportion of this surplus is economically utilized in co-operation with the various electric power companies whose mains extend over the whole industrial area of the north-east coast. In this connection, it is interesting to note that, apart from one company, practically no coal is burnt on the Tyne for power purposes except in the chemical works—this being all in the direction of smoke reduction and coal economy. The remainder of the surplus is utilized at the coke-oven works for steam-raising or in gas-engines. One instance of modern practice is seen in a large steel-works, where a battery of ovens supplies all the requisite coke for the blast-furnaces, and the surplus gas, mixed with the blast-furnace gas, is utilized in gas-engines, and the whole motive power of the works so obtained for the steel and rolling mills. The only steam raised, for use mainly in sulphate of ammonia plant, is obtained from an experimental boiler heated by coke-oven gas working on the surface combustion system introduced by Professor Bone.

In the district comprising Widnes, Runcorn, and Liverpool, which is under the supervision of Mr. Herbert Porter, F.I.C., there are 45 alkali and other scheduled and registered works, and the number of separate processes under inspection last year was 101. The different methods of treating the sulphuretted hydrogen evolved from gas-works liquor are shown as follows, in terms of sulphate of ammonia percentage of the total make: Absorbed by lime or oxide of iron, 17·6; by combustion, 9·4; by other methods, including absorption in ammoniacal liquor, 73. Mr. Porter says all this class of plant, as well as the tar plant, was properly worked and maintained during the year. Tar is distilled at six works in the district.

Reporting upon North and East Lancashire and part of Yorkshire, Mr. H. J. Bailey says there were 58 premises registered for the processes connected with the production of gas liquor and sulphate and muriate of ammonia during last year. At 51 of them, sulphate of ammonia was produced; at 11, gas liquor; and at two, muriate of ammonia. The proportion of ammonia produced by continuous distillation was 97·2 per cent. of the whole, calculated as sulphate. Ammonia liquor produced at coke-oven plants was distilled at four works. At two of them, the Claus process dealt with the foul gases emitted; and at one, the foul gases were destroyed by combustion—the average total acidity of the chimney at these works being 0·91 grain per cubic foot, expressed in terms of sulphur trioxide. The flat heap method of oxide purification has now been introduced into eleven works, and the results have proved very satisfactory. There was no cause of complaint at any of the works during the year. There were 24 works registered for the distillation of tar; four works having been closed, and two new works being registered during the year. These works were all carried on without causing complaint. A considerable quantity of tar was prepared for use on roads. This kept many distillers busy during the summer months; and it has had a marked effect on stocks.

Mr. Robert D. Littlefield, in his report upon the East Midland district, states that the number of works registered as sulphate and muriate of ammonia and gas-liquor works remains as before—viz., 59; eight of them being liquor works. During the year a new installation of plant for the complete direct absorption of the ammonia contained in coke-oven gases was inaugurated; and the process is working very satisfactorily. Sulphate of ammonia is made at 50 works—as to 48 of them by the continuous process, and as to two by the intermittent process. The proportion of liquor distilled by the former process amounted to 99·3 per cent. of the whole. The sulphate of ammonia equivalent of the total liquor dealt with in the district during the year shows an increase of 4 per cent. compared with the previous twelve months. Separating the sources of ammoniacal liquor into "coke-oven bye-product plants" and "gas-works plants," the increase in the former case amounted to 5 per cent., and in the latter case to 3·3 per cent., over the corresponding figures for 1910. Four new tar plants were registered—bringing the number up to 19. All were well conducted.

Mr. Edward Jackson, who has the supervision of the South Midland and Norfolk district, reports an addition of five new works for the manufacture of sulphate of ammonia last year; but six were closed. His district contains 193 works, in which 271 separate processes are under inspection. The number of sulphate and muriate of ammonia and gas-liquor works in which ammonium sulphate, chloride, or carbonate is manufactured, or liquor concentrated, is 106; but, as more than one of the operations is carried on at some of the works, the number of separate processes under inspection is now 120. Four of the new plants already mentioned are at gas-works, and the noxious saturator gases are arrested in oxide of iron purifiers. The remaining new works are in connection with coke-ovens. No extension is reported of the "direct" method of sulphate of ammonia manufacture in this district. The plant was designed mainly to meet the spent liquor difficulty in ordinary gas-works where the effluent disposal gives rise to trouble. It worked successfully during the past year at the one works where it has been put in. By this process it is estimated that the effluent is reduced by 75 per cent. As the method becomes better known, Mr. Jackson thinks it likely to be more extensively adopted.

Ammoniacal compounds are recovered at 21 coke-oven plants in the district. Sulphate of ammonia is produced at 20 of these, and gas liquor concentrated at two. At four works, muriate of ammonia is also recovered from the thick tar from the mains. The sulphate of ammonia manufactured in these works is still increasing, and represents 37·5 per cent. of the entire production in the district. Out of the 106 works registered where ammoniacal compounds are manufactured, in 77 cases sulphate and other compounds of ammonia are produced from liquor in ordinary gas-works—representing 48·8 per cent. of the total sulphate made in the district. The proportion of liquor distilled by the continuous process is 99·8 per cent.

There are now 39 works in the district where the distillation of tar is carried on. At one works, formerly registered, the tar plant has been dismantled. Two new works have been registered; so that there is a net increase of one works for the year. Both of the new plants have been erected at gas-works for the production of "prepared tar" used for road dressing. In each case a Wilton still has been put in. Small lime purifiers are attached. Mr. Jackson says this class of operation is likely to be considerably extended in consequence of the demand for tar for use on roads. There has also been a gradual extension of the double-still system—*i.e.*, primary and secondary still—as there is great economy and a marked increase in output from plants erected on this principle. As to the methods employed for treating the worm-end gases, in seventeen works they are dealt with by combustion; in eleven, oxide of iron is employed to arrest the noxious gases; at eight, lime purifiers are used; and at one works an elaborate condensing arrangement is successfully worked for arresting these vapours. The remaining two works have also special methods.

Dr. Alfred C. Fryer had 171 works and 238 processes under inspection last year in the district comprising the South and South-West of England; and in this work he was assisted by Dr. Bailey. Twelve new works were added to the register; seven being for the manufacture of sulphate of ammonia and one for the distillation of tar. Three of the former are on the direct method; one is a small intermittent plant; and the rest have continuous stills, hand-fishing saturators, and suitable condensers, and the sulphuretted hydrogen generated in the process is absorbed in heaps of oxide of iron. Complaints were received in the early part of the year respecting noxious vapours escaping from the sulphate of ammonia plant at one works. On investigation, it was found that the plant was not always in operation when the smells were complained of, and the objectionable fumes were evolved from burning heaps of town refuse in the neighbourhood of the works. Complaints still continue to be made against the Bournemouth Gas Company's works at Branksome; and as yet no satisfactory explanation has been given. Mr. Fryer says the complaints are frequently made when the sulphate plant is not in operation; and consequently he believes the smells do not emanate from the source named.

The disposal of sulphuretted hydrogen by combustion and subsequent neutralization of the acid products is in use in three works in Dr. Fryer's district; and the following table gives the results of tests (showing the acidity of the gases in grains of SO_3 per cubic foot) obtained at these plants:—

	Leaving Furnace.	Leaving Wash-Tower.	Leaving Limestone Scrubber.	Percentage Condensed.
	8·25	5·10	0 35	95·8
	74 20	31·00	0·63	99·2
	21·50	9·25	0·20	99·1
Average 1911	34·65	15·12	0·39	98·8
Average 1910	33·43	14·64	0·45	98·7

The highest recorded acidity of the gases leaving the furnace was 102 grains as SO_3 per cubic foot, and the final escape was reduced to 0·72 grain.

Dr. Fryer next deals with the direct method of making sulphate of ammonia, which has already been described in the "JOURNAL," and makes the following remarks:

This form of plant is now in use at four works in the district. The original experimental plant which was erected at the Wareham Gas-Works continues to give complete satisfaction, and efforts are now being made to obtain all the fixed ammonia. Gas engineers are still undecided as to whether it is profitable to extract the fixed ammonia at very small works; but at a much larger installation of this form of plant at the works of the Woking District Gas Company, Limited, the Resident Engineer and Manager (Mr. William H. Ely) informs me that for a portion of the year their make averaged 22·3 lbs. of sulphate of ammonia per ton of coal carbonized. The smallest gas-works registered in this district is the reconstructed works at Titchfield, in Hampshire, where the amount of coal carbonized per annum does not at present exceed 200 tons.

This method of manufacturing sulphate of ammonia, with its low initial capital cost, and ease of operation without the necessity of any great amount of attention, will be appreciated by small gas undertakings, where difficulty is frequently experienced in the disposal of gas liquor. It has been estimated that in sulphate manufacture the working losses, when the plant is in perfect condition, do not exceed 0·06 per cent. of ammonia in the liquor dealt with, or from 2½ to 3 per cent. of the whole. But the possibilities of loss during the storage of liquor and its transit are considerable. It is well known that when gas liquor is exposed to the air, ammonia evaporates therefrom; and it has been calculated that, even in a still atmosphere, as much as from 3 to 5 per cent. of the whole amount exposed may be lost in 24 hours. To prevent this loss, the direct method of sulphate of ammonia manufacture offers a solution to the problem, as the ammonia is fixed with sulphuric acid as fast as it is produced—thus doing away with the necessity for storing any liquor.

For some years, Mr. Frank C. Taylor, the Manager of the Shanklin Gas-Works, has adopted the plan of washing the still with hot water every day the ammonium sulphate plant has been in operation. Mr. Taylor found this method very beneficial in preventing the formation of scale on the trays, and it was rarely that the plant had to undergo a thorough overhauling—in fact, it is three years since any part of the still was last opened. The method is the invention of Mr. Fred W. Taylor, now of Harpenden, Herts.

Industrial progress is largely based on the cost of production. The increase of wages, rates and taxes, as well as the cost of raw material, are all seriously considered by the producer, while any simplification of plant or process and the most efficient method of using the raw material are factors which are never absent from his mind. The Burkheiser process for the production of sulphate of ammonia without the addition of sulphuric acid is one which gas engineers will therefore examine carefully. The Burkheiser method holds out a prospect of cleansing coal gas and producing sulphate of ammonia in one process; for the Burkheiser salt is the immediate product of the purification of the gas and the complete utilization of the raw material—viz., the coal. Up to now, the sulphur in coal has been considered a deleterious impurity; and costly plant has been employed for its removal. The inventor of the Burkheiser process takes advantage, however, of the sulphur and utilizes it—first absorbing it in a specially active oxide of iron, and then converting it into sulphurous acid, which binds the ammonia in the gas. The process is a fascinating one to the chemist.

Referring to gas-liquor works, Dr. Fryer remarks that in considering them reference may be made to cyanogen, which may be viewed either as an impurity in the gas which was to be removed or as a residual to be recovered. It is chiefly objectionable because it forms ferrocyanide in the presence of iron salts. The question of the recovery of cyanogen as a residual product must, he says, be determined by local economic considerations. Should an increased demand ever arise for cyanide, its recovery would, he considers, doubtless become general.

The distillation of tar is now carried on at eleven works in Dr. Fryer's district. In three of them, the combustion method is in use for rendering the worm-end gases inoffensive before being discharged into the atmosphere; and in the other works, lime and oxide purifiers are usually employed to arrest the noxious gases. The demand for "prepared" tar is now increasing; and suitable apparatus has been installed at several works. As the local authorities are dressing the roads with large quantities of this tar to meet the increased volume of motor traffic, Dr. Fryer says it is well that greater care is being exercised, "for when raw tar is heated on the highway the volatile products evolved are liable to create a nuisance, and the washings from roads treated with raw or imperfectly prepared tar may very seriously pollute neighbouring streams.

The number of works registered last year in the district comprising South Wales and Monmouthshire, which is under the supervision of Dr. T. L. Bailey, was 117—an increase of five; two being gas-works producing sulphate of ammonia and one a coke-oven works with bye-products plant. Close attention was given to the sulphate of ammonia plants. At one small works, where the general conditions were becoming unsatisfactory, repairs and alterations were effected as desired, and all is now in good order. At a second works, where the output has been advancing during recent years, it was found increasingly difficult to ensure a satisfactory condition of the one purification heap. However, two heaps with a hydraulic change-valve have been provided. With satisfactory cooling of the foul gases, if necessary by means of water sprayed on to the condenser pipes, and with the provision of at least two oxide heaps for each plant, Dr. Bailey says there is little difficulty in avoiding all nuisance which might be due to the escape of foul gases. But there is a great difficulty in getting men to understand the necessity for frequent changing-over from one heap to another; there being a tendency to work one heap too long. The total amount of ammonium salts, in terms of sulphate, produced in this district during the past year again shows an increase; being 13·9 per cent. more than the production in the year 1910, and 36 per cent. more than in 1907.

Mr. F. Napier Sutton reports an increase of seven works in the district comprising the Eastern and South-Eastern Counties; five of them being registered as gas-liquor and sulphate of ammonia works. No complaint of nuisance or damage arising from registered works was received last year. Practically the whole of the liquor was treated by continuous distillation methods. Plant for the direct recovery of ammonia from crude coal gas has been erected at two small works in the district. The direct utilization of the sulphur content of the saturator gases for the manufacture of sulphuric acid is carried on at the three largest works supplying gas to London. The proportion of the gas thus utilized is 61·2 per cent. of the whole, and shows an increase of 2 per cent. on the year 1910. The Claus sulphur-recovery process was in use at ten works, and dealt with 16·9 per cent. of the gases. The most general method of disposing of the foul gases is by absorption in oxide of iron, and it is practised at 63 works; but the proportion of gas so treated is only 10·9 per cent. The use of oxide heaps placed on the ground level on a concrete floor continues to extend; and Mr. Sutton says the method has many advantages in respect to cost and efficiency over the box form of purifiers, although a somewhat larger ground area is required. The largest works in the district using the method has an annual sulphate make of 900 tons; but the system is found to be cheaper and more efficient than the Claus plant formerly used. The importance of adequate distributing area for the gas below the oxide heap is again urged; several cases of improved efficiency having resulted from attention to this point.

The treatment of saturator gases by combustion in a special burner and subsequent neutralization of the acid product in towers packed with limestone is carried out at eleven works, and represents 9·8 per cent. of the total. Mr. Sutton points out that the plant employed requires somewhat close periodic attention, as high efficiency depends on several factors. The limestone requires replenishing as it is dissolved by the acid, the water supply to the towers must be continuous and ample, and the draught needs control. Actual chemical tests of the inlet and outlet gases are required to estimate the efficiency of neutralization, which should reach 95 per cent. The following table shows the average results of tests taken from the neutralizing plants in the past two years:—

Total Acidity of Gases as SO_3. Grains per Cubic Foot.			Percentage of Acid Removed and Neutralized.	
Leaving Furnace.	Leaving Washer.	Leaving Limestone Scrubber.	1911.	1910.
59·26	29·25	3·16	94·6	99·4
19·95	10·41	1·51	92·4	97·7
32·91	14·35	0·65	98·0	95·7
30·92	4·52	1·10	96·4	94·2
7·93	2·02	0·05	99·3	99·1
26·75	1·85	0·07	99·7	99·5
25·25	10·80	0·53	97·9	99·2
17·51	10·35	0·85	95·1	99·3
30·06	—	1·48	95 1	95·0
Aver. 27·84	10·44	1·04	96·3	97·9

Including the two works using the "direct" method for recovery of ammonia from coal gas, there are four works at which the foul gases are passed to the coal-gas purifiers. At two works only are the saturator gases burnt in the retort or boiler flues.

A double fatality unfortunately occurred at one gas-works in October last. A scrubbing tower used for the purification of gas liquor was in course of being repacked by a workman. Foul gas entered this through a connecting-pipe which joined the foul-gas main of the sulphate of ammonia plant. The pipe was safeguarded against any back-passage of gas by means of a cock and two separate water-seals. After the accident, it was found that, through unaccountable neglect, the man in charge of the plant (who lost his life in a brave attempt to rescue his fellow-workman) had forgotten to close the cock, and had failed to refill one of the water-seal vessels which had been cleaned. The second water-seal was apparently in order, and contained sufficient water for effective seal; but the gas-pipe, which was sealed by 8 inches of water, had fractured above, and the fatal gases thus obtained a passage. Mr. Sutton says the fatality emphasizes the wisdom and necessity of complete disconnection from any other plant where poisonous gases may exist, on occasions of men entering within closed apparatus.

There are in the district 21 works engaged in partially or completely distilling tar. One of the newly registered works is well equipped to treat considerable quantities of this residual; and a patented still of novel design is used, together with other stills for refining products. The permanent gases are dealt with by absorption in oxide of iron. There has been a further installation of plant for the continuous dehydration of tar by the heated coil method. The tar is raised to a certain temperature under pressure in a coil enclosed within a brickwork heating chamber, and is delivered into an expansion box, at which point the volatile constituents (light oil and water) separate more or less completely from the less volatile residuum. The principle follows somewhat on the lines of Mr. F. Lennard's method for the continuous distillation and fractionation of tar. Mr. Sutton says "the small-coil plant appears capable of dehydrating completely, provided the raw tar does not contain a very high percentage of water; but with over 20 per cent. of water, dehydration does not appear possible in one operation."

The demand for partially distilled or "prepared" tar for road-making purposes was enormous in the past summer, when exceptionally favourable weather conditions existed for this work. Much tar was used for road dressing as a preventative of dust troubles after simple physical separation of water at the gas-works. But Mr. Sutton points out that such tar cannot comply with the Road Board's specification; and its use is liable to cause serious trouble by contamination of streams and destruction of fish life. The supply of tar to distillers was seriously curtailed, and its scarcity resulted in a considerably increased value of both raw tar and tar products.

Report to the Secretary for Scotland.

As already mentioned in the "JOURNAL" [*ante*, p. 250], the Chief Inspector's report to the Local Government Board is accompanied by one presented to the Secretary for Scotland, which embodies a report by Mr. J. W. Young, B.Sc., the District Inspector for this part of Great Britain. We will deal with the latter first.

Of the 281 processes under inspection by Mr. Young, 106 relate to the manufacture of sulphate and muriate of ammonia, 5 to the treatment of gas liquor, and 42 to the distillation of tar. The quantity of sulphate of ammonia produced was—

	Tons.
Gas-works	20,206
Iron-works	18,861
Shale-works	60,765
Producer-gas, coke, and carbonizing works	21,507
Total	121,339

Mr. Young states that though the number of works dealing with gas liquor increases, the production of sulphate remains stationary; the tendency being for the smaller gas-works to manufacture for themselves rather than sell their liquor. The reasons for this are mainly economic. The total quantity of liquor distilled last year was equivalent to 20,206 tons of sulphate, and the number of works using continuous distillation plant was 65. The sulphuretted hydrogen evolved in the process of manufacture was dealt with mainly by oxide of iron purifiers. Mr. Young reports that these have been maintained in better order than before; managers having become more aware of the advantage they obtain by regular attention and renewal of the material. But he adds that "prejudice in favour of old methods, causing sour, inert, and impervious purifiers, is hard to overcome. With regard to tar-works, he says that with last year's dry summer and the general improvement in road making it was not easy to satisfy the demands for "boiled" tar.

Turning now to the Chief Inspector's report, he points out that the total production of sulphate of ammonia in Scotland continues to expand. The entire production last year, as shown by Mr. Young, was 121,339 tons, compared with 116,958 tons in 1910—a difference of 4381 tons. There was a drop of 128 tons in the yield from gas-works. Iron-works, however, produced 46 tons more; shale-works, 1652 tons more; and producer-gas, &c., works, 2811 tons more. Mr. Curphey explains that the decrease in the case of gas-works synchronizes with a movement to obtain from coal a larger volume of gas per ton, with a consequent reduction in the quantity of coal required to meet a given demand for gas. The small increase from iron-works is associated with a slight decrease in the total production of Scottish pig iron, and a fractionally smaller average number of furnaces in blast. The additional production from shale-works shows continued activity in this industry; and the increase from producer gas, coke, and carbonizing works is due to a further extension of processes in operation classed under this heading. Gas-works, it is stated, "have now fallen to the third place as regards production of sulphate of ammonia in Scotland, in a minor degree owing to the relatively smaller yield of bye-products already referred to, but chiefly because of the recent development of recovery plant attached to gas-producer and coke-oven works."

The direct system of ammonia recovery has not so far been adopted in any Scottish gas-works. In the majority of gas-works where the scale of operations is large enough to make the process attractive, plant is already in operation for the production of sulphate of ammonia by the usual method of distillation of ammoniacal liquor. With the exception of two works where the waste gases are otherwise dealt with, oxide of iron purifiers are in use in all these works for the absorption of the sulphuretted hydrogen. The tendency of the oxide to become acid or "sour," and to revivify sluggishly or not at all, has always been more or less evident in Scotland, and is prejudicial to the efficiency of the purifier.

Experience in England in works of a similar character is markedly different. The causes of this seemed worthy of inquiry; and in the Chief Inspector's report to the Local Government Board an account is given of such work as opportunity permitted to be done during the past year. [See "JOURNAL" last week, p. 324.] Mr. Curphey expresses his appreciation of the thorough and painstaking response made by Mr. Alexander Yuill, of Dundee, to his request for information as to the working conditions obtaining at the purifiers connected with the sulphate plant at his works, and which were utilized in the account of experiments made relative to the behaviour of oxide under the influence of sulphuretted hydrogen and air under varying conditions.

In continuance of the table presented in recent annual reports as to the progress of shale distillation and ammonia recovery, Mr. Curphey gives figures compiled from the statistical returns to the Home Office on Mines and Quarries for the last ten years to Dec. 31, 1911, and from returns of sulphate manufactured.

Year.	Total Shale Mined and Quarried in Scotland.	Total Sulphate of Ammonia Recovered from the Shale in Paraffin Oil Works.	Yield per Ton of Shale.
	Tons.	Tons.	Pounds.
1902	2,105,953	36,931	39·3
1903	2,009,265	37,353	41·6
1904	2,331,885	42,486	40·8
1905	2,493,081	46,344	41·6
1906	2,545,724	48,534	42·7
1907	2,690,028	51,338	42·7
1908	2,892,039	53,628	41·5
1909	2,967,017	57,048	43·1
1910	3,130,280	59,113	42·3
1911	3,116,803	60,765	43·7

Mr. Curphey remarks that of recent years there has not been great variation in the yield of sulphate of ammonia calculated per ton of shale mined and quarried in Scotland. This ratio is affected by various factors, among which may be mentioned: (1) Shale used elsewhere than in oil-works; (2) variations in the nitrogen contained in the shale; (3) methods of treatment of the shale. The last is the only one under the control of the management in shale-works. "The methods of shale distillation have now," he says, "attained a high degree of efficiency combined with very low costs. The system of vertical retorts, now attracting much attention in gas-works practice, has for many years been effectively applied to the extraction of oil from shale; and this lengthened experience has led to highly efficient designs of retorts being now in operation—the outcome of many minds which have sought to improve on previous practice."

The "Leicester" Gas-Steam Radiator.

Messrs. Ashwell and Nesbit, Limited, of Barkby Lane, Leicester, forward a catalogue of their "Leicester" gas-steam radiators. This appliance, it is claimed, contains a number of improvements that make for economy in gas consumption and efficiency in heating, and it is also a perfect sanitary radiator. The products of combustion are entirely removed from the apartment; and the bunsen burner is arranged with an air control which has suitable adjustment for governing the volume of gas. There is a special device to prevent back-firing when the volume of gas is reduced or entirely cut off; and the gas supply is automatically controlled by a thermostatic valve which operates through ranges of temperature. The catalogue points out that heat which would otherwise be lost is utilized to heat a current of air which flows through an interior casing and, becoming warmed, circulates and diffuses in the apartment. In an alternative arrangement, this casing may be connected to an outside wall, and a fresh supply of air be provided which will be warmed during its passage through the radiator, and before it enters the apartment. Regulation is effected by an open-and-shut louvre ventilator.

IMPROVED HEATING OF RETORT-SETTINGS.

The firm of MM. Stein et Cie., of Paris, have taken out a patent for France for an improved method of heating horizontal or inclined retorts for the carbonization of coal or other substances; and they claim that the special construction described in the specification ensures better distribution of the heat. The following are some particulars of the system.

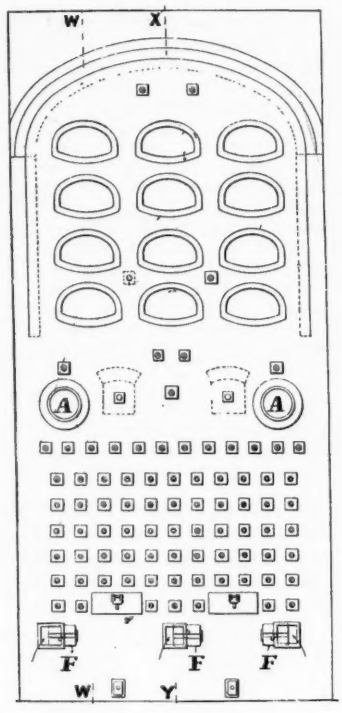


Fig. 1.

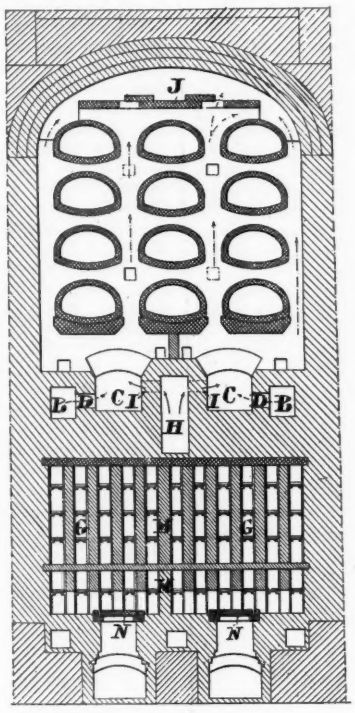


Fig. 3.

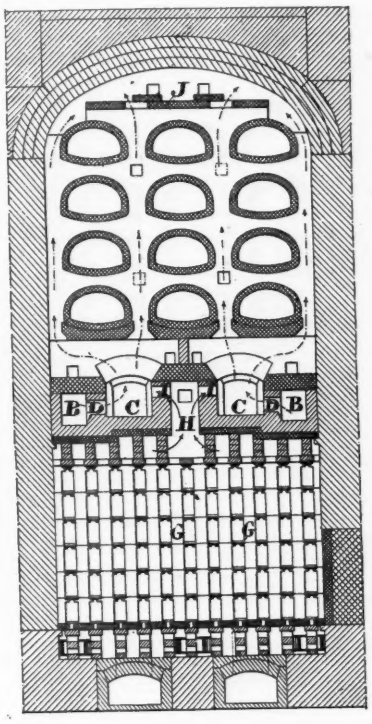


Fig. 4.

The gas from the producer, which is separated from the setting, enters at each side by two passages running into a combustion chamber, where it mixes with air. Thus the setting can be divided into four parts, each two opposite the others, and each having its own gas intake. The front of the retorts is heated by the ascending current of gases from the combustion chamber. These gases, after coming into contact with the upper wall of the setting, descend along the portion of the retorts in the middle part, and thence flow to the regenerators.

In the accompanying illustrations, fig. 1 is a front view of the setting; fig. 2 shows on the left-hand portion a half longitudinal section of the setting on the line W of fig. 1, and on the right a similar section on the line X; fig. 3 is a transverse section on the line Y, and fig. 4 a similar section on the line *Z*, of fig. 2.

The gas produced by a generator of ordinary type, using any kind of fuel, enters, through passages A into the flues B communicating with the combustion chambers C (fig. 3) by the openings D. There are four combustion chambers, each fed with gas from the passages D, as indicated by the broken arrows. The air necessary for combustion enters on each end of the retort through passages E, at the base of the setting, the opening of which is accurately regulated by small slide-valves F. On leaving the passages, the air runs between the stacks in a regenerator G, where it is heated, and then passes into a collector H. It then finds its way into the combustion chambers through the passages I. The path followed by the air before entering the chambers is indicated by the solid arrows.

On leaving the chambers C, the products of combustion are distributed over the retorts in an ascending direction on the parts of the setting between the end walls and the partitions. They then come into contact with a flagging J, furnished with openings, the dimensions of which can be regulated with movable flags, as shown in figs. 3 and 4, thus giving a suitable distribution of the flames, as required. After leaving the flagging, the gases impinge against the arch of the setting, and then pass downwards in the parts of the setting between the partitions and the central wall K. After heating the retorts, the burnt gases pass into the regenerator G, and then circulate through baffles in the stacks constructed in the usual way, and give off their residual heat. Thence they run through the flue L to the chimney. The path of the combustion gases is represented by mixed lines.

Each regenerator is divided into two distinct parts by walls M, to regulate the temperature of the various parts of the setting. There is a damper N at the bottom of each division, to govern separately the distribution of the flames in each section, and consequently the temperature of each quarter of the section. It will be seen that the setting may comprise any number of retorts, horizontal or inclined, and that when the number is increased there may be more than four divisions in the setting to regulate the heat.

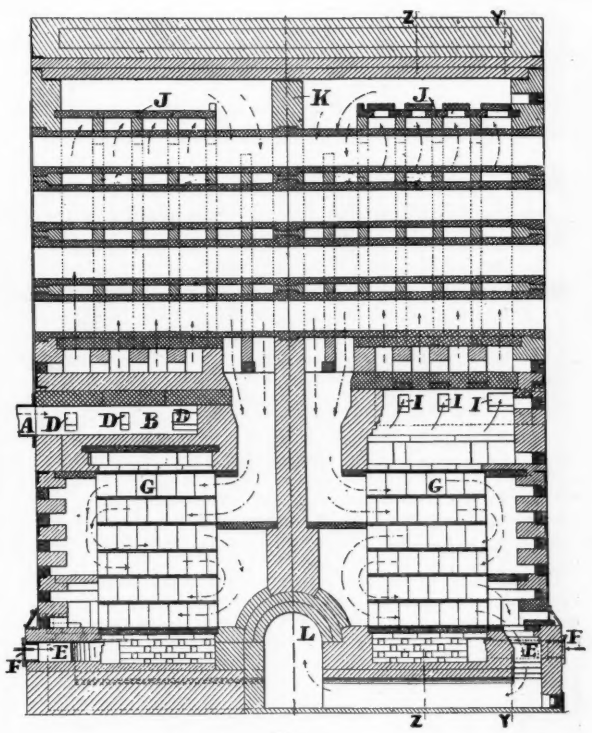
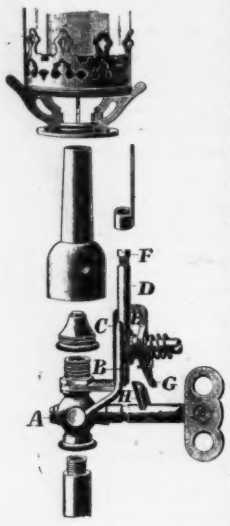


Fig. 2.

As might be expected, the bulk of the "Co-Partners' Magazine" of the Gaslight and Coke Company for the current month is occupied with the various celebrations in connection with the Company's centenary. A photographic reproduction of the portrait of the Governor presented to him by the staff forms a frontispiece; and accompanying the number is a large map of the Company's district. It is explained that, owing to the shape of the district, it was not found practicable to adapt any existing map of London for the purpose; and permission was obtained to utilize certain sections of the Ordnance Survey map. From these sheets the Company's map was prepared; and the various manufacturing stations, district offices, &c., are clearly marked upon it.

A FERRO-CERIUM SELF-LIGHTING TAP.

It was mentioned, in the course of the report of the proceedings at the recent congress of the Société Technique du Gas en France, that M. Grebel brought under the notice of the members, in a short paper, a self-lighting tap devised by him, one of which was on view in the entrance hall of the place of meeting. In the construction of the tap, the constituent parts of which are shown in the accompanying illustration, the inventor utilizes an alloy of iron and cerium patented by Dr. Auer in 1906. It emits very hot sparks with slight shock; and 3 decigrammes (4·6 grains) of it will produce about 8000 sparks. The appliance consists of a tap A, containing a main passage for the admission of the gas to the burner, and a subsidiary one ending in the small tube B, through which passes the jet of gas for lighting the burner. A support C, fixed on the tap, carries a pipe D, containing the small stick of ferro-cerium, which is pressed against a steel rowel E by a screw-cap F, to which is attached a push-spring and a horizontal axis upon which are mounted the rowel and a cam G connected by a screw coupling. A spiral spring serves the double purpose of pressing the cam against the rowel and bringing the former to its normal position, determined by a stop on the pipe D. The key carries a spur H, for the purpose of actuating the cam.



If the key is turned gently from right to left until the tap is completely opened, the spur pushes the cam, and, by means of the mechanism shown, the steel rowel is brought into action. The friction of this upon the ferro-cerium produces a spark, which ignites the jet of gas admitted by the tube B; and a kind of tongue of flame lights the burner. This is done without either shock or explosion. As soon as the tap is fully open, the flash-light is automatically extinguished. To put out the gas, the key is turned in the opposite direction. The action of the tap is as easy and as rapid as that of an ordinary one. When used with upright burners, it has either an ordinary key or an arm with small chains attached. A special type of tap is being constructed for use with inverted burners.

GAS LIGHTING UNDER PRESSURE.

By Samuel B. Chandler.

[From the "Co-Partnership Journal" of the South Metropolitan Gas Company.]

The burning of flames under high and low pressures produces conditions very different one from the other. In the low-pressure inverted burner, a mixture comparatively poor in air issues at a low velocity and doubles back upon itself—the flame merely licking the inner surface of the mantle; the products escaping by means of the space left between burner nozzle and mantle ring. One of the advantages of the inverted over the upright burner lies in the regenerative effect produced by the preheating of the mixture; the position in which the flame burns heating the nozzle and mixing-chamber, the temperature being thereby increased, and greater incandescence of the mantle resulting. If, however, the preheating is carried too far, undue resistance is set up in the nozzle, and the quantity of air is reduced owing to loss of velocity; thereby causing an alteration in the mixture and a consequent decrease of flame temperature.

Granting, therefore, the resistance exercised by the burner to the flow of gas, it appears there is but one thing to do to overcome such resistance, and that is to increase the pressure. The ordinary type of burner does not warrant the use of pressure-raising plant, for as soon as the mixture becomes further preheated or more highly aërated, a new difficulty arises—viz., "lighting-back." If to overcome this the burner-nozzle is reduced, the resistance is once again increased, the flame loses its shape owing to increased velocity, the gas ceases to turn back upon itself naturally, and the ordinary shape of mantle becomes unsuitable. To give the best results, the mantle must fit the flame.

Such preheating and the large proportion of air increasing the tendency to light-back, it only remains to increase the rate of flow of the gas—using, of course, a burner specially designed to deal with the new conditions. The resultant flame becoming elongated requires a special shape of mantle to take it. At the same time, it is necessary to reduce the area of the mantle in proportion to the quantity of gas consumed as compared with low-pressure burners, as, owing to the larger proportion of air, complete combustion takes place in a much smaller space, resulting in an intensely hot flame.

In the application of pressure to obtain this high duty from the gas, the following conditions must be observed: (1) Combustion must take place as rapidly as possible in order to obtain the high local temperature necessary. (2) The shape of the flame must be made suitable to that of the mantle, so ensuring that the latter may be in the hottest part of it. (3) The velocity of the flow of gas must be maintained to permit of close and intimate contact of gas and air, ensure thorough mixing, and prevent the possibility of lighting-back.

Incandescence varies greatly in degree, and is probably due to increased rate of vibration of the molecules forming the gas, set up either by chemical action or mechanical force, or a combination of both these forms of energy. Under high pressure, gas does not depend so much upon the introduction of secondary air for combustion as when under ordinary district pressure the large quantity of air drawn in by the velocity of the gas more fully aërating the gas on its way to the burner-nozzle, and becoming thoroughly mixed and preheated by contact with the "heater," fixed directly to and above the nozzle. The pressure to which the gas is raised to overcome the resistance referred to and allow of a slight surplus, of course, depends upon the type of lamp used. But, generally speaking, 2 lbs. to the square inch may be taken as the pressure under which lamps work, though in some cases, where the nipples have been specially adjusted, it has been found of advantage to increase the pressure to 2·9 lbs. to the square inch (80 to 81 inches water column); and this higher pressure is, I believe, prevalent among users of the inverted high-pressure lamp to-day. The term "pressure" is to be taken to mean any force exerted above the unit of pressure known as the "atmosphere" (14·7 lbs. to the square inch); so that if we have a mercury column showing 6 inches, we really have a pressure above the atmospheric datum of 14·7 + 2·9 = 17·6 lbs. to the square inch.

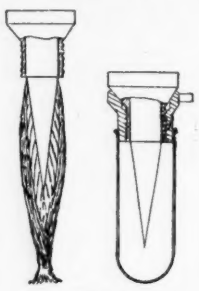


Fig. 1.

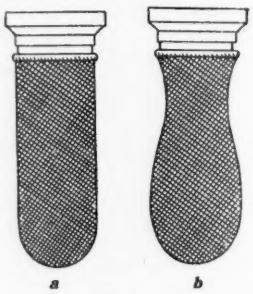


Fig. 2.

In attaching the mantle, it will be noticed that the ring forms a close connection with the burner-nozzle. This has been found to be of advantage, and the products have to pass through the mesh of the mantle—just the opposite to low-pressure burners. [See fig. 1.] A very important feature contributing towards the maximum efficiency of the burner, apart from the correct adjustment of gas and air and cleanliness of the lamp proper, is the fixing of the mantle and its correct shaping. Mainly, the non-collodionized or "soft" mantle is used; it being agreed that this form is better than the collodionized. The risk of breakage is very considerably minimized, and the mantle itself has a better start in life. Care must be exercised in fixing and burning off, and the fabric should be so handled that the correct shape is produced. The ideal form is that in fig. 2 (*a*), while (*b*) shows the natural shape assumed if the mantle is not properly attached—the bulbous form indicated causing lessened efficiency.

Of the various kinds of fabric—single, double, and sometimes triple knitted or woven—it is believed that a higher lighting efficiency is obtained by the use of the single woven, though from the point of view of strength and durability the double-woven mantle may be preferable.

The part played by reflectors is very marked and important when considering the economical application of lighting. Various requirements are met with. Some shopmen prefer lamps which not only light up the window, stallboard, and part of the pavement, but which, by their brilliancy, themselves form an advertisement. Such lamps are used even in cases where the window space is already illuminated by interior fittings. In some instances, however, by reason of special window dressing or other causes, the use of reflecting media is very desirable; the window being better illuminated by a smaller unit than would be the case if the reflector were not utilized. The general appearance and effectiveness are also improved, accompanied by an entire absence of the uncomfortable effect experienced with all forms of high intrinsic brilliancy, the rays of which, if allowed to enter the eye, seriously interfere with visual accuracy. Owing to the surface brilliancy of the incandescent mantle being spread over such a large area, and also to its steadiness, it is far less likely to injuriously affect the retina than the electric arc, which emits light from a very small crater of highly actinic rays in a constant state of movement.

An excellent type of reflector, and the one mostly used, is the "parabolic," the effect of which is to highly concentrate the "flux" or flow of light in the direction required; and an examination of a polar curve in this connection is interesting. Fig. 3 represents a curve characteristic of the 1000-candle power lamp working at 81 inches water column; the dotted line showing the

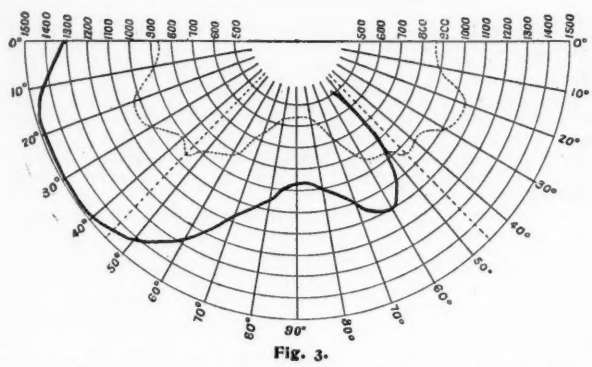


Fig. 3.

result with clear globe and ordinary top shade, and the full line the result of the introduction of the parabolic reflector. The alteration in direction of the light and the improvement in distribution are very clear, and the results between 0° (horizontal) and 90° (vertical) may be tabulated as follows:—

Angle from Horizontal Plane.	Candle Power with Ordinary Top Shade.	Candle Power with Parabolic Reflector.	Angle from Horizontal Plane.	Candle Power with Ordinary Top Shade.	Candle Power with Parabolic Reflector.
0° ..	860 ..	1300	50° ..	875 ..	1410
10° ..	900 ..	1440	60° ..	820 ..	1275
20° ..	1030 ..	1475	70° ..	660 ..	1070
30° ..	1000 ..	1475	80° ..	575 ..	950
40° ..	920 ..	1470	90° ..	550 ..	870

UTILIZATION OF PEAT FOR POWER PURPOSES.

At the Meeting of the Institution of Mechanical Engineers in Belfast last Wednesday, Mr. H. V. Pegg, of that city, read a paper on "The Commercial Utilization of Peat for Power Purposes," in the course of which he made the following remarks.

The question of the utilization of peat fuel for power purposes has received a large amount of attention from engineers for many years past. Efforts in this direction have mostly taken the shape of some form of preparation of peat fuel in order primarily to get rid of the superabundant moisture. Very large sums of money have been spent on peat-preparing machinery, with generally very inadequate results. Hence it has always appeared to the author that, to bring the utilization of peat to a commercial level, the first consideration would be the employment of the peat as far as possible in the condition in which it leaves the boglands, without any preliminary and expensive machine treatment.

The author said he had the opportunity about seven years ago of experimenting with air-dried hand-cut peat fired into a special form of gas-producer. With all gas-producers using bituminous fuel, the main trouble is to get rid of the tarry bye-product. In this instance, the gas-producer was arranged to work intermittently; there being periods of "blowing" during which the fuel in the producer was urged to incandescence, and periods of gas making during which the tarry bye-products were passed through the incandescent fuel, where they were split up into gas. The chief difficulty experienced with this plant was the high thermal value of the gas generated—about 330 B.Th.U. Owing to the high and varying percentage of hydrogen in the gas, it proved unsuitable for use in the works gas-engine; and though the plant was running more or less continuously for ten days, driving the whole works, very considerable trouble was experienced, not only in the engine but also in the plant, owing to the varying moisture content of the peat—the producer plant being decidedly sensitive in regard to this latter point.

From the experience then gained, it appeared evident that it would be wiser to extract the tar from the gas, rather than to try to utilize it by converting it into gas, and further that the producer must be comparatively non-sensitive to the amount of moisture in the peat fuel. Some two years ago, the author discussed the question of the utilization of air-dried peat fuel with Mr. Hamilton Robb, of Portadown, who, having large supplies of such fuel convenient to his factory at that place, was strongly of opinion that it should be possible to utilize such fuel in order to generate the power required in the factory. As the result of various tests run with an experimental plant, special plant was manufactured to the author's specification, and has been running ever since last September.

Air-dried peat is not a very convenient fuel to fire into the producer, and as it was uncertain whether it would be possible to burn the fuel direct in the form in which it came from the boglands, provision was originally made in the plant to deal with peat fuel prepared by being reduced in size to blocks of about 5 inches cube. But it was found possible to dispense with the preliminary treatment; and the construction of the plant was thereby considerably simplified.

As regards the general running of the plant, last October it was subjected to a test run of six hours' duration with a load of 250 B.H.P.; the peat consumption per B.H.P.-hour averaging 2·55 lbs., the peat fuel containing 18·98 per cent. of water. This was with both producers running, though the load was considerably below the total capacity of the plant. When necessary, it has been found that the above load can be safely carried with either producer working singly; and the plant has run under these conditions for several days.

It will be noted that the percentage of moisture in the fuel during the above test was unusually low. This was owing to the very dry summer of 1911. During November and especially December last, the fuel fed to the plant was extremely wet, as the rainfall in these months was very heavy, and the fuel supply was, and is, entirely exposed to the weather. The plant, however, worked just as well with sodden peat as it did with the drier peat; the only difference being the amount of fuel consumed. The amount of water in the "sodden peat" varied considerably from day to day, and the exact percentage was not arrived at. As nearly as could be estimated, it was at least 70 per cent.

The separation of the tar from the gas was the chief difficulty to be overcome. It was found far better to rely on an ample water-spray through which the gas passed rather than any form of a coke scrubber, as the coke rapidly became clogged with tar. The main portion of the tar was thrown out into a sump by a centrifugal tar-extractor. But unless the gases were subjected to thorough washing and cooling by the water-spray, it was found that a certain proportion of tar passed the extractor, collected in the gas-mains, and finally found its way into the gas-engines. It was a matter of experiment as to the precise amount of water sprayed into the cooler which was necessary in order to ensure that the tar vapour should be sufficiently condensed before reaching the centrifugal extractor to enable this to effect the needful separation. As now arranged, the proportion of tar in the gas after passing the extractor is small, and the engine-valves do not want cleaning out more than once a week.

When first started, the plant generally, and especially the producers, required a thorough cleaning once a week. At the present date, the plant can be run if necessary for three weeks without cleaning, though the weekly cleaning generally takes place as a matter of policy. This result has been obtained owing to the increased quantity of washing-water used, which now amounts to about 7 gallons per brake horse power per hour. The proportion of tar recovered is about 5 per cent. of the weight of fuel consumed. During the initial stages of the running of the plant, a certain amount of tar was sold to tar-felt manufacturers at a price of 35s. per ton; but sales in this direction ceased, owing to an, at present, ineradicable pyroligneous odour which persistently clings not only to the tar but to the various oils distilled from it.

Experiments have also been made with the tar in oil-burning boilers; but, owing to the very high percentage of water in the tar—up to 50 per cent.—and the large quantity of solid matter also present, a great amount of preliminary treatment is necessary. For a considerable period the tar at Portadown was used mixed with coal and burnt under a Stirling boiler. The precise heating value of the tar so consumed has not, however, been ascertained. At the present time, the whole factory at Portadown is run entirely on peat fuel; the consumption being about 44 tons per week, of which the producer plant takes about 22 tons. The nature of the peat varies considerably. With good black heavy peat, the weekly consumption for all purposes drops as low as 35 tons; and with light top peat from the surface of the boglands it rises to 54 tons. It is also interesting to note that the quality of the peat is reflected in the carrying capacity of the barges, which bring a load of 35 tons with heavy peat and 24 tons with light peat. The peat is unloaded from the barges and conveyed to the producer platform and boiler-house by a transporter. Clinker troubles are not often experienced, and only when burning the inferior grade of peat—the presence of sand in the fuel causing the trouble.

The author is indebted to Mr. W. A. Mullen, the Manager at the factory of Messrs. Hamilton Robb, Limited, for the following figures (June 12 last) in regard to the cost of fuel:—

Cost per week of running factory on coal—			
8½ tons of anthracite, at 35s.	£14	17	6
19 tons of steam coal, at 17s.	16	3	0
Total	£31	0	6
Cost per week of running factory on peat—			
Say up to 50 tons of peat, at 6s.	15	0	0
Weekly saving	£16	0	6

Allowing 15s. for extra labour, the net weekly saving figures out at £15s. 5s. 6d.

Appended are the results of analyses of samples of tar and peat, and also of an average sample of gas during a ten-hours' trial.

Sample of Tar.

	Per Cent.
Water	37·2
Light oils (distilling below 230° C.)	5·8
Middle oils (distilling at 230° to 270° C.)	8·3
Heavy oils (distilling above 270° C.)	23·2
Coke	17·8
Loss	7·7
	100·0

The sample was grey when received, but it very quickly burned black. Much frothing occurred until the water was distilled off. Towards the end the temperature went higher than a mercury thermometer will record (360° C.). The different fractions obtained were as follows: (1) Water faintly acid to litmus.

Phenol could not be detected. (2) Light oils became rapidly dark red in colour. Specific gravity of crude liquid, ·930. (3) Middle oils became dark red. Specific gravity of crude liquid, ·944. (4) On the heavy oils standing, crystals of paraffin wax separated out to the extent of 5·42 per cent. of the fraction (= 1·26 per cent. of the original tar). The specific gravity of the liquid portion of this fraction was ·906.

Sample of Peat.

	Per Cent.
Carbon	44·60
Hydrogen	5·42
Nitrogen	0·97
Ash	1·10
Moisture	18·98
Oxygen (by difference)	28·93
	100·00

Sample of Gas.

[Moisture in fuel, 26 per cent.]

CO_2	10·6
CO	21·0
H_2	13·0
CH_4	3·7
Total combustible	37·7 per cent.
Calorific value (calculated from analysis)	144·0 B.Th.U.

NEXT YEAR'S "GAS ENGINEERING" AND "GAS SUPPLY" QUESTIONS.

In another part of the "JOURNAL," reference is made to the issue of the programme of the Technological Department of the City and Guilds of London Institute for the session 1912-13. As before, separate examinations will be held in "Gas Engineering," including manufacture, and "Gas Supply," including distribution and the various applications of gas; and they will include questions founded upon the following subjects.

GAS ENGINEERING.

GRADE I.

1. The construction and setting of retorts for the destructive distillation of coal, and the furnaces or producers for heating them.
2. The methods of charging and discharging retorts, and the machine and other tools employed; the fittings of the retort-bench, including the hydraulic (or dry) main.
3. The effects of modifications of carbonizing temperature upon the quantity and quality of gas yielded by the coal.
4. The description of apparatus for the manufacture of water gas (uncarburetted or carburetted), and the practical working of the plant.
5. The principles and methods of gas condensation, with descriptions of apparatus employed.
6. The exhauster, its construction, its use or object, and the means by which it is actuated and controlled.
7. The methods of removing the gaseous impurities present in the gas after condensation, together with the apparatus and materials employed. The chemical reactions involved.
8. The various instruments used in gas-works for ascertaining and recording pressure and exhaust, and their practical employment and significance.
9. Usual methods and apparatus employed for testing coal gas, water gas, producer gas, waste gas, &c., including the usual tests for illuminating power, calorific value, specific gravity, and the purity of the gas supplied to the public, and those for ascertaining the value of the bye-products.
10. The simpler physical and chemical principles involved in the ordinary processes of gas manufacture and the formation of the bye-products.
11. The general principles involved in the construction of the gas-holder and its tank. The advantages of the holder in gas distribution. The laying of mains and services. The necessary methods for securing an adequate supply of gas throughout the area of a district. The methods and instruments employed at the works for the due control of the pressure in the street mains.
12. The fitting-up of premises for the supply of gas for light, heat, and power. The construction, testing, and fixing of gas-meters. The influence of temperature and pressure on the volume of gas.
13. The construction of various types of gas-burners. The simpler physical and chemical principles involved in the combustion of gas. The economy and efficiency of incandescent lighting as contrasted with luminous flames. High-pressure lighting.

FINAL EXAMINATION.

In this examination more difficult questions will be set in the subjects named in the Syllabus of Grade I., and, in addition, a knowledge will be required of the following:

1. The characteristic properties of the various kinds of coal, and their value for gas-making purposes.
2. The effects of temperature upon the production of residuals.
3. Chemical composition and physical properties of coal gas, and the influence of each component upon the illuminating power and calorific value of the gas.
4. The principles of combustion, and their application to the working of retort-furnaces.
5. The more advanced physical and chemical principles involved in the processes of destructive distillation of coal, and in the condensation and purification of the resulting gas.
6. The methods of complete gas analysis, including those for ascertaining the amount of impurities in the crude gas. Method of testing oil to be used in the manufacture of carburetted water gas.
7. Theory and practice of photometry, calorimetry, and pyrometry. Full details of apparatus employed.
8. Gas lighting. High and low grade gases. Illuminating power. Flame temperature. Specific heats. Air supply. Incandescent lighting, theory and practice. Intensified lighting. Burners and apparatus.
9. Application of power, and labour-saving appliances in gas-works.
10. The construction of gas-works plant generally.
11. The management of the various portions of the plant in order to obtain the best efficiency of the apparatus, with due regard to economy in working.
12. The method of dealing with such emergencies as are of more common occurence in gas-works through the breakdown of machinery or other failure of plant.
13. Working-up ammoniacal liquor and treating waste products.
14. Gas in competition for light, heat, and power.
15. The construction, working, and efficiency of the gas-engine.
16. Flow of gas in mains, theory and practice. High-pressure distribution.
17. Structural capacity. Working costs.
18. Such important recent developments of the gas industry as have been fully described in the Technical Press.

GAS SUPPLY.

GRADE I.

1. *Mains and Services.*—Station and district governors. General principles of distribution. The various kinds of pipes and fittings used, and testing of same. Comparative advantages of wrought iron, cast iron, and steel. Methods of laying. Various forms of joints and methods of jointing. Maintaining supply during alterations to existing mains and services. Causes, preventives, and methods of dealing with corrosion and deposits. Unaccounted-for gas. Causes of, and testing for, leakage. Syphons. Valves. Pressure gauges. Maintenance.
2. *Gas-Meters.*—Principles and construction of gas-meters, including slot and stop mechanism. Repairing and fixing of meters. Appliances required for, and regulations governing, official tests of meters.
3. *Plumbing.*—Properties and composition of various alloys, such as brass, gun-metal, &c., used for valves, cocks, gas-fittings, &c. Solders, their composition, preparation, and uses. Methods of soldering.
4. *Interior Fittings.*—Description and size of pipes in relation to requirements. Distribution of light. Testing of installations. Anti-vibrators. Movable pendants. Other fittings and accessories. Simple principles of ventilation. Governing pressure beyond the meter.
5. *Luminous and Bunsen Flames.*—Theory and application of.
6. *General Lighting.*—Construction of flat-flame, argand, regenerative, and incandescent burners. Regulation of gas and air supply to burners. Causes and prevention of mantle breakages. Influence of shades, globes, wall-papers, &c., on light efficiency.
7. *Outside Shop and Street Lighting.*—Types and construction of lanterns, including burners and other fittings. Principles of wind-proof lanterns. Suspension brackets and lamp-pillars.
8. *Use of Gas for Heating Purposes.*—Construction, types, and fixing of cookers, boilers, fires, irons, &c. Hot-water circulating appliances. Geysers. Flues for waste products.
9. *Gas Power.*—Construction and practice of the gas-engine.
10. *Tools and Appliances.*—A full knowledge must be obtained of all the tools and appliances necessary for repair and extensions, from the works governors to the point of combustion.

FINAL EXAMINATION.

1. *Mains and Services.*—Flow of gas in mains, theory and practice. Electrolysis and electric fusion. Pressures and pressure-recording instruments. Main-laying costs in relation to prospective income. First aid in cases of "gassing." High-pressure distribution. Fans, blowers, and compressors. Subways, advantages and disadvantages of. The carrying of mains over bridges and under rivers and canals. Explosive mixtures.
2. *Interior Fittings.*—Specifications. Principles and construction of various types of burners and plant for intensified lighting. Lighting of churches, factories, and other large buildings. Theory and practice of ventilation by gas. Lighting for special purposes, such as billiard-tables, &c. Switch lighting.
3. *General Lighting.*—Efficiency of flat-flame, incandescent, and other burners. Low and high pressure lighting. Theory, manufacture, composition, and testing of the incandescent mantle. Illuminating effect of different methods of lighting. Flame temperature. Air supply. Hygiene of gas.
4. *Outside Shop and Street Lighting.*—Public lighting. Testing for illuminating power and illuminating effect. Advertising and illuminating devices. Automatic lamplighting appliances.
5. *Influence of Reflection on Indoor and Outdoor Lighting.*—Reflecting powers of various surfaces and the means of ascertaining same.
6. *Gas used for Heating Purposes.*—Industrial and domestic uses of gas. Testing of heating appliances. The application of refractory materials to the construction of heating (and lighting) appliances. Influence of air supply and flame temperature.
7. *Gas Power.*—Calorific power. Comparative costs and thermal and mechanical efficiencies of the gas-engine and competing power agents. Gas-driven electricity plants.
8. *Physics and Chemistry as applied to Lighting and Heating.*—The physical laws of temperature, radiation, conduction, convection, reflection, and refraction. The physical and chemical laws concerning diffusion and humidity. Instruments used for investigation, including spectroscopes, hygrometers, and thermoscopic appliances.
9. *Competition.*—Gas in competition for light, heat, and power.
10. *Statutory Enactments, &c.*—The general legal obligations affecting gas supply. The Factory and Workshop Acts, so far as they relate to the use of gas lighting and heating appliances and the purity of the atmosphere in rooms. The relative fire risks of various illuminants, and the effect on insurance rates.
11. *Developments.*—Such important recent developments in any of the foregoing subjects as have been described in the Technical Press.

THE NEW WATER-WORKS FOR SKEGNESS.

By Percy Griffith, M.Inst.C.E.

[Extracts from a Paper before the Institution of Water Engineers.]

The works which are the subject of this paper were undertaken by the Right Hon. the Earl of Scarbrough, C.B., to whom the recent rapid development, if not the very existence, of the popular seaside resort of Skegness is exclusively due.

The author was called in to advise upon the question of water supply in 1904; and, after assisting as Consulting Engineer in the promotion of the Skegness Water Act, 1905, he designed and carried out the scheme of which he now proposes to describe some of the more interesting features.

Preliminary Survey of the District.

The first point of interest appears to him to be the preliminary survey of the district, with the object of deciding upon the best available source from which the required supply should be obtained. In this connection, the supply in use when the author was consulted first claims attention.

The then existing works were situated about a mile inland from the coast, and about half-a-mile from the western boundary of the town. They comprised four borings to the greensand formation —one having been carried to a depth of 420 feet, but yielding by no means a proportionately larger quantity of water. The pumping plant included boilers (one vertical and two of the locomotive type) and four pumping-engines of various types. An air-lift plant had been temporarily in use for testing purposes, but had been discarded owing to its excessive fuel consumption. Over the pumping machinery was a brick tower, carrying a steel tank with a capacity of 10,800 gallons. Some small sand filters had been constructed at ground level to deal with the fine sand which was occasionally brought up with the water. While, however, there was no serious difficulty in obtaining a sufficient quantity of water from this source and on this site, the one and fatal objection to such a scheme was the presence of sodium chloride in the supply; the proportion having, in 1902, reached 73 grains per gallon, and having subsequently shown a tendency to increase. It may be interesting to remark here that this high proportion of salt in the supply was not seriously objected to by the residents. On the contrary, the author himself heard complaints of the "insipidity" of the water when the new supply was first turned on to the town; and it was distinctly suggested that the change was prejudicial to health—at least, in the case of those previously accustomed to the saline supply.

On entering upon his investigation, the author found that on various previous occasions reports had been made as to alternative sources of supply, and that many useful data were available. It appeared that Skegness was a very fair example of the difficulties which the east coast towns generally present to the water engineer, especially where the local underground supply is saline. Situated on the edge of a level marshy plain four miles wide at its narrowest part, the nearest river is eight miles distant. The chalk springs, which are thrown out by a fault running approximately north and south between Welton and Alford, could not be collected free from risk of pollution nearer than seven miles away. The topography of the district is, of course, quite fatal to any chance of a gravitation supply; and the only practicable alternative was the greensand tapped sufficiently far from the sea to avoid risk of excessive salinity. The author was therefore led to advise the adoption of a scheme for tapping the greensand water at Orby, Welton, or Willoughby, situated respectively at six, eight, and ten miles from Skegness.

The Trial Boring.

With the evidence available, the author selected a site at Welton for the trial boring; and he sees no reason to regret his choice. It was carried out with 10-inch tubes to a depth of 50 feet from the surface; and 8-inch diameter tubes were afterwards driven to a depth of 186 feet—the upper end being left level with the surface so as to avoid the risk of contamination of the water at the junction between the tubes. Below this the boring was continued with a 6¼-inch cylindrical tool (working in loose shot) to 252 feet, and it penetrated the Kimmeridge clay for a depth of 20 feet. On reaching this depth, the flow of water at the surface was found to be 4320 gallons per hour. A test with air-lift plant produced a gradually increasing yield, which ultimately reached a maximum of 30,000 gallons per hour, with an average "pumping level" not exceeding 40 feet below the surface; and, allowing for uncertainties and contingencies inseparable from borings of this nature, it was calculated that a fairly constant yield of 20,000 gallons per hour might be had. From the results obtained with the permanent pumps, the yield at a depth of 35 feet below the surface was proved to be 18,000 gallons per hour.

Well and Pumping Machinery.

The flow from the boring having been proved satisfactory both as regards quantity and quality, it was decided to rely upon the trial boring as a permanent source of supply, and to sink a well around the upper part of the 8-inch tubes to take the pump suction. It was carried to a depth 43 feet below the surface, and was lined partly with brickwork in cement and partly with cast-iron cylinders. The top of the well was opened out into a rectangular pump chamber, 10 ft. 6 in. deep, which gave ready access to all the working parts of the pumps.

The machinery was in duplicate throughout, and comprised suction (or producer) gas plant, a gas-engine, and one of Hayward Tyler's three-throw plunger pumps. The head-gear consisted of a belt-driven fast-and-loose pulley worked from the engine, and a cast-iron pinion working into a mortice spur-wheel on the pump crank-shaft. The speed was thus reduced from 175 revolutions per minute at the engine to 37 at the pumps, which had a capacity at this speed of 18,400 gallons per hour. The working head on the pumps was found to be 210 feet, including "suction head" and friction in the rising main. The whole of the plant gave complete satisfaction in working, and the guaranteed duty (expressed in the form of a maximum fuel consumption of 1·60 lbs. of anthracite nuts per 2,000,000 foot-pounds of work done, when measured in water lifted) was, in the official test, considerably improved upon, even when the pump-valves were much scored by sand. Had they been renewed before the test, a much better result would have been obtained. This test revealed a net fuel cost of 0·12d. per 1000 gallons lifted 100 feet.

Filtering Plant—Difficulty with Sand.

The works were sufficiently near completion to allow of the supply being transferred from the old to the new works on April 6, 1908; and once the seven miles of new supply main had been thoroughly washed through, no trouble whatever was at first experienced in regard to the water. On the 3rd of July, however, the water was found to have a thick, milky-white appearance; and this proved so persistent that the use of the new supply had to be temporarily abandoned. For several reasons (speed of delivery being one of the most important) the author decided to recommend the immediate installation of three "Bell" pressure filters. These were connected-up to the delivery main from the pumps, so that the water could be pumped through them or direct to the reservoir at will. In the meantime, apparatus was set up for shelling out the bore-tube and for clearing the sand accumulated in the well; and by carefully dividing the time between "shelling" and pumping, the supply to Skegness was resumed and maintained without intermission, even during the month of August, when the demand reached something over 210,000 gallons in one day.

On the first attempt to use the filters, it was found that their efficiency in dealing with the sand in the water was decidedly limited; and the author's experience in this connection may possibly be useful to other members. A careful analysis of the sandy matter deposited in the filters proved it to consist of fine grey sand with occasional fragments of very sandy clay and occasional nodules of black hard rock. It was in the first instance thought that the argillaceous matter came from the clay beds at the bottom of the boring; but subsequent evidence tended to negative this opinion, and to point to a failure of the band of rock in which the 8-inch bore-tubes were bedded—thus allowing the clay from above the tube end to fall into the open boring. The effect of the clay upon the filters was, however, fatal to their efficiency. When any large proportion of this was present, the filters would rapidly choke, and in the course of an hour or less the back-pressure would rise to the limit of safety, and the filter would have to be washed out. The quantity of sandy matter which thus had to be disposed of was also a serious inconvenience, as it discoloured the neighbouring ditches and streams. Some settling-tanks were erected to deal with this; but the result was only partially satisfactory. The use of sulphate of alumina in the filters, while it increased their ability to arrest the sand and clay, rather accentuated the general inconvenience, as it shortened the period during which they would work between successive washings.

In view of the ultimate purchase of the undertaking by the Skegness Urban District Council, Mr. Brough Taylor, M.Inst.C.E., was asked to co-operate with the author in dealing with the sand difficulty; and the remedy which was proposed as a result of this consultation was the sinking of a second or duplicate borehole terminating at a depth of 210 feet, and 12-inch (minimum) diameter, adjacent to the first, but sufficiently far away to avoid the cavity formed by pumping out the loose sand from around the first boring, and connected with the pumping well by means of a syphon. Owing to the negotiations connected with the transfer of the undertaking to the Urban District Council, the second boring was not completed until the autumn of 1910. The result, however, has been entirely satisfactory—no further trouble with sand having occurred since it was brought into regular use at the works.

Reinforced Concrete Reservoir.

The next point of special interest in connection with these works was the adoption of reinforced concrete for the service reservoir. This was constructed on a hilltop a mile-and-a-quarter west of the pumping-station; the elevation being 200 feet above Ordnance datum—ample to give the necessary pressure at Skegness, allowing for friction in the main. The capacity is 400,000 gallons when full; and the reservoir is divided by a transverse partition, 5 ft. 6 in. high, into two parts, to provide for cleaning out the floor without throwing the reservoir out of use. To avoid the expense of laying a double line of main between the pumping-station and the reservoir, the rising main enters at the bottom, and serves as an outlet main as well; in fact, during the time pumping is in operation, the supply does not enter the reservoir except so far as the rate of pumping exceeds the demand at Skegness. No inconvenience has been experienced from the resulting risk that a leak in the main might possibly empty the

reservoir, as, by providing proper supervision, assisted by automatic alarms at suitable points, the Engineer has promptly dealt with the leaks that have occurred long before any loss of importance has taken place.

The system of reinforcement adopted is the + and H bar, securely wired at intersections; the roof being supported by concrete girders reinforced along lines of tensional stress. The internal dimensions are 100 ft. by 70 ft. in plan, with 10 feet depth of water. The external walls are 8 inches thick at the base and 6 inches thick at the top, supported at 7-feet centres by external counterforts, 12 inches wide, tapering from 1 ft. 9 in. at the base to 9 inches at the top (additional to the thickness of the walls). The floor was not reinforced, and is 9 inches thick, extending 12 inches beyond the external walls, and thickened to 12 inches under the piers. These are 16 inches square at the base; tapering to 10 inches square at the top, and are arranged at 16 ft. 8 in. centres along the major axis, and 14 feet centres on the minor axis. The roof is 6 inches thick, supported on concrete girders 12 inches deep (additional to the thickness of the roof) and 8 inches wide.

The top of the roof is rendered with 2 inches, the inside of the walls with 1 inch, and the inside of the floor with 1½ inches of cement; the whole of the work being a model of what rendering should be.

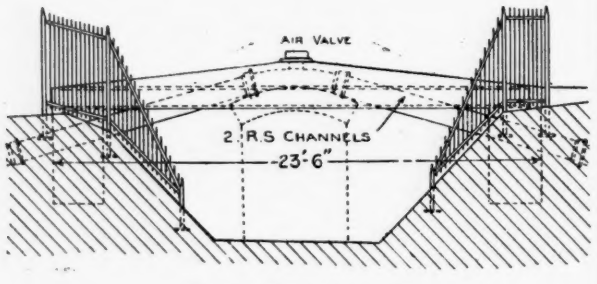
As regards the use of reinforced concrete for service reservoirs, the author is satisfied that, as regards economy and stability, the system is far more satisfactory than ordinary brickwork or concrete construction. The cost in this case—£2309—was perhaps somewhat below market prices, as the contractors were very anxious to secure the order. But, even so, the author is satisfied that ordinary construction of equal stability would have cost more than did the design adopted. As regards water-tightness, he does not consider that reinforcement gives any material advantage; the result depending entirely upon the efficiency of the rendering. But in this instance, there is no doubt that the work was carried out so efficiently that the reservoir may be looked upon as a model for imitation.

Supply Main to Skegness.

As the seven miles of 10-inch delivery main between the new pumping-station at Welton and the tower tank at the old works traversed throughout its length flat marshy country intersected by numerous dykes or drains which were under the control of "Commissioners" having very drastic statutory powers, it appears to the author that it may be useful to refer to some points of interest which arose in this connection.

To provide for the possibility of allowing the natural surface yield of the boring to gravitate to Skegness—a proposal which was subsequently abandoned—the first 1¼ miles of the main were laid across private property. But beyond the elaborate legal procedure involved in serving notices on owners and occupiers, and in settling terms of payment for wayleaves, this portion of the work did not involve any features not common to the remainder. The crossing under the railway was carried out by means of a brick culvert large enough to give access to the main and to allow of its ultimate duplication.

The crossing of the main dykes or streams was, however, a more interesting matter, as these were too deep to allow of the pipes being conveniently laid underneath (as in the case of the shallower dykes or drains); and the Drainage Commissioners were very exigeant in regard to the possible obstruction of the waterway. The main was in each case curved upwards and formed into an arch, partly for strength, and partly to secure a convenient apex on which to fix an air-valve. The main was, however, supported on steel "channels," and buried in concrete in every case as shown in the accompanying illustration. At



Example of Dyke Crossing.

crossings under the smaller dykes, the main was in each instance laid in concrete. Sluice-valves and washouts were placed at intervals averaging three-quarters of a mile; the dykes providing convenient points of discharge for the latter, except, perhaps, on the occasions when the main became charged with discoloured water previously referred to.

This work, including the main from the pumping-station to the reservoir, was carried out in a most excellent manner by Messrs. John Aird and Sons. The total cost involved was £8386, or an average of 12s. per yard, including all items involved, except land and wayleaves.

Cost of the Works.

The actual cost of the various sections of the new works was as follows:—

Service reservoir	£2,309	7	4
Mains and laying	8,386	0	5
Venturi meter	187	18	6
Buildings and foundations	2,805	13	11
Telephone	554	4	3
Pumping machinery	2,285	12	10
Filters	1,111	9	6
Shelling boring, No. 1, &c.	629	11	11
Second boring	1,224	3	4
Total	£19,494	2	0

In conclusion, the author feels some regret that, in order to emphasize points which appeared to be of special interest to water engineers, he has been compelled to omit many minor details which would, perhaps, have been useful for reference. At the same time, it must be obvious that, in a paper of this sort, it would be impossible to record all the useful lessons learnt and the experience gained from the carrying-out of a scheme such as the one herein described.

[In appendices to the paper, the author gave reports on the testing of the pumping machinery and the working results at the Welton pumping-station.]

Discussion.

Mr. Towler asked where the water-levels as recorded at the commencement and the end of the trials were taken from. Mr. Griffith stated that when pumping 18,000 gallons of water per hour he got a suction of 35 feet below the surface. The speed of pumping was nominally 37 revolutions per minute; at the trial it was about 39 revolutions. The slip in one trial was 12 per cent., and in the other 30 per cent. It was stated that the valves were not quite tight at the time. He should like to know if the slip was permanent, or if it was reduced later on. They were told of the heavy loss from banking during the time the plant was not working. It had often been claimed by manufacturers of suction plant that banking losses were quite nominal. He thought they might conclude that this was a very economical installation. It would use probably less than half the weight of fuel that a good steam plant would require. This, however, would use fuel which would come to less than half the price of that employed for a suction-gas plant. He should like to ask Mr. Griffith what was done with the overflow from the purifiers. This was said to be exceedingly poisonous to cattle; and great care was desirable with regard to the effluent.

Mr. C. H. Priestley (Cardiff) remarked that very few of those who were practising as water engineers in provincial towns had to deal with new installations; and therefore it would be interesting to them to know the total cost per 1000 gallons of water. He understood that Mr. Griffith considered the installation at Skegness to be an economical one. He (the speaker) had no doubt it was; and he thought it might be taken as a standard one for small towns like Skegness. He considered Mr. Griffith had made rather too much of the rendering. To say that the structure did not matter if the rendering was all right, was, in his opinion, rather too much. He thought the structure should be all right in the first instance; and then with a good rendering on it they would no doubt have a perfect job. On the question of pumping into the reservoir and the town mains at the same time, he rather differed from Mr. Griffith. He had experienced some difficulty in an installation at Cardiff; and he had put in a duplicate main, so that he would not have to pump direct into the town mains.

Mr. C. H. Roberts (Aberdeen) remarked that the water from the lower greensand was of a chalky nature, and not suitable for storage in a reservoir for any length of time, as it was found by experience to become stale, and to depreciate in quality, if it was left stagnant in the reservoir. He therefore thought that the system adopted in the present case of pumping into the reservoir and the town mains at the same time was not to be recommended, owing to the absence of circulation in the reservoir. In regard to the position of the reservoir, the author stated that it was some seven miles distant from Skegness. He (Mr. Roberts) could not see any reference in the paper to a reservoir for storing water in the town, with the exception of a small tank holding less than an hour's supply. In the case of a fracture of the 10-inch main, or it being found necessary to repair any of the valves, Skegness would have to be left without water, unless the repairs could be done while the town was being supplied from the small tank, which he did not think was possible. With regard to the sand difficulty, as the author explained it was probably due to the breaking-down of a stratum of argillaceous material passed by the 8-inch tubes. He did not know whether the author had considered the question of settling the water first with a coagulant. He presumed that, the sand difficulty having been removed owing to a larger borehole having been put down, the filters were not required.

Mr. Paterson said the value of the paper would have been increased if Mr. Griffith had included an analysis of the water, which was a point of particular interest in turbid water such as that described. The silt often choked up the filters in such cases; and Mr. Griffith was fortunate in being able to avoid this by putting down another borehole. He (the speaker) would have liked to hear what the author would have proposed to do had he been unable to get rid of the silt in that way. Alumina had been

suggested. He (Mr. Paterson) had had experience of a similar case; and the simplest method of treatment seemed to be the addition of lime, which formed a heavy precipitate, and the water, after a few hours, was practically clear—no difficulty being experienced in making it perfectly clear by filtering. The difficulty with added alumina was that they might get some reaction. Another point was the pumping direct from the well through the filters to the reservoir. In many cases this worked thoroughly satisfactorily; but when dealing with a doubtful water it was a great advantage first to get the water up to the ground level, and then they could arrange the plant as circumstances might render necessary. When they had to pump direct from a deep well into the town mains, they were more or less handicapped.

Mr. J. Dewhirst (Chelmsford) observed that in the Eastern Counties they had a vast amount of sand in suspension in the water. When his Council first contemplated constructing their own water-works, it was the usual practice to put down a rather small trial boring. The result in almost every case was that, after pumping some time, they found fine sand and clay in suspension to such an extent that they could not use the water. Sand filters were put down in the first instance. But they proved a failure; and, after considerable inquiry, it was decided to instal a mechanical filter. With this he believed the difficulty could be overcome. The last boring he put down was 11½ inches; and from this he had less sand and more water than from any other. The next one would be 14 inches. He agreed with Mr. Griffith that the secret of water-tightness lay in the manipulation of the rendering.

Mr. F. W. Hodson (Loughborough) said he should like to have some further information with regard to the effect of the change of water on the health of the inhabitants of Skegness and on the place itself as a health resort. His own opinion was that the good effect produced was due rather to the strength of the water than to that of the air. Mr. Griffith had told them what was the proportion of chloride of sodium in the water. He (Mr. Hodson) had always been under the impression that it would take not less than 70 grains per gallon to produce a taste of salt; but when he drank the Skegness water, he detected a very decided taste of salt. He thought that the change in the supply brought about by Mr. Griffith, though it would probably give the consumers water of purer quality, might be prejudicial to Skegness as a health resort. He should like to know whether there were any statistics in regard to the general health of the inhabitants which would enable them to obtain any reliable data on the point to which he had referred.

Mr. Griffith, in reply, referred first to Mr. Towler's remarks. He said the figures as to the level of the water in the well were quoted from the official report of the test; and, for convenience, they were taken from the bottom of the well. Mr. Towler also referred to the slip in the pumps. This was high during the test, owing to sand passing through the pump having naturally scored the valves. The slip, however, was then larger than at any other time. He had not with him any definite test of the slip; but he could state with confidence that when other tests were made the result was satisfactory. With regard to Mr. Towler's other remarks, he suggested that if the comparative cost of the fuel used was taken into account, the result was about the same as if a steam plant had been employed. He (Mr. Griffith) was bound to suggest that this was not altogether the position with reference to the Skegness plant. The cost of the fuel used would be approximately about 31s.; and that of ordinary steam coal, delivered at the works, would be 22s. So that, admitting the consumption of fuel was one-half that of the steam plant, he thought it would be acknowledged that the suction-gas plant "had it." The scrubber waste, also mentioned by Mr. Towler, was a real difficulty in these plants; and in this particular case they had rather a struggle to get over it. The waste was objectionable; and, though he had never heard of cattle being actually poisoned, they certainly did receive complaints from neighbouring riparian owners that cattle were affected. This, he thought, was imagination. He did not think the effluent really injured live-stock, and at any rate, when the quantity was small in proportion to the volume of the stream, he would admit that the difficulty was a serious one; and he should be glad when some ingenious person introduced a plan for the treatment of the waste which would eliminate its objectionable qualities. Mr. Priestley had asked if the cost of pumping per 1000 gallons supplied included the capital charges. These figures would be available when possible; but he had good reasons for not complicating his results by stating them. Mr. Priestley had referred to the rendering. Perhaps he (Mr. Griffith) had over-emphasized the importance of this; but he saw no reason to alter the view he held—that as regards structural stability he preferred reinforced concrete to anything, though to secure water-tightness he would prefer to have a good rendering put on afterwards. The small amount of storage, to which Mr. Roberts had alluded, was an interesting point. The amount of 10,800 gallons provided for near the town was intended to be a safeguard against the fracture of the main. Risks had to be taken in all works of this kind with regard to fractured mains; and he did not think those in the present case were more than normal, or were likely to cause trouble. The filters were still in use, and they had been found useful as a safeguard against an occasional inflow of sand not sufficient in quantity to discolour the water. But sand had found its way into the filters, where, however, it was better than in the town supply. The question had been raised as to why settling was not resorted to in dealing with the sand difficulty. This point was considered most carefully; and the process was not adopted because it would have taken a long time to provide suitable storage for sedimentation, and would have cost a large amount. He thanked Mr. Paterson for his suggestion as to the use of lime in connection with sedimentation. He thought it would have assisted sedimentation to have added lime. Another question dealt with was that of pumping direct through the filters, compared with the use of gravity filters. The former course involved double pumping; and they had to judge as to the circumstances in each case. There were objections to the course; but they did not apply in every case. He thanked Mr. Dewhirst for his remarks. It was always interesting to hear of difficulties such as those to which he had referred, and particularly when they were furnished with details of the methods adopted to overcome them. He had no figures such as those for which Mr. Hodson had asked; but he thought the change in the water would be more likely to enhance than otherwise the popularity of Skegness among visitors, though, as he had already told them, the residents liked the old slightly saline water.

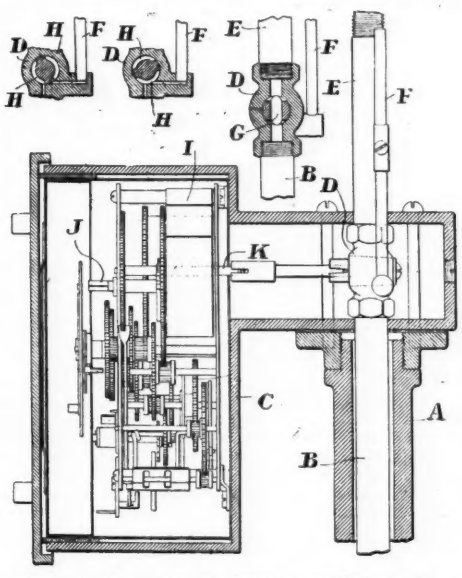
REGISTER OF PATENTS.

Automatic Gas Lighting and Extinguishing Apparatus.

Seamon, P. R., of Roxbury, Mass., U.S.A.

No. 24,631; Nov. 6, 1911.

This invention relates to time mechanism provided with an extension which is secured to the top of the lamp-post and in which a valve is located. The casing and its time mechanism are, therefore, supported from the lamp-post through the extension. The connection between the valve and the extension is a detachable one, to permit the time mechanism to be readily removed without disturbing the valve.



Seamon's Automatic Gas-Lighter and Extinguisher.

A is the lamp-post and B the pipe through which gas is delivered to the burner. The casing C contains the valve-controlling mechanism, and is provided with an extension adapted to be secured to the top of the lamp-post, and which receives within it a valve D that controls the supply of gas to the delivery pipe E and bye-pass pipe F.

The plug valve D (turned at proper intervals by the clock mechanism) has a main port G and the two bye-pass ports H, in the nature of grooves on the periphery of the plug separated by portions of the plug itself. The valve is provided with a port which leads to the bye-pass pipe and another communicating with the supply pipe B. The main port and the bye-pass ports have such a relation that when the plug is adjusted to open the main port (as shown) the bye-pass ports will be situated so that one of the barriers will close communication between the ports, and thus shut off the gas from the pipe which leads to the pilot-burner. When the valve plug is given a quarter turn, the main burner will be shut off and the bye-pass ports will admit gas to the pilot-burner. When the valve plug makes another quarter revolution, the pilot-burner is shut off and the main burner turned on. The arrangement of ports is such that the gas is turned on to the pilot-burner before the main burner is shut off, and is also turned on to the main burner before the pilot-burner is shut off.

The mechanism for operating the valve is so arranged that at each movement of it the valve plug will be given a quarter turn—thereby to turn off or on the main burner. The valve-actuating mechanism is of the type that involves a spring for actuating the valve, a locking device which normally holds the spring from action, and time mechanism to release the locking device and permit the valve to be actuated at predetermined intervals. The spring I for operating the valve is similar to the ordinary main spring of a clock, and is wound up by a key applied to the spring arbor J. This spring actuates gearing which

meshes with, and drives, a pinion on a shaft K, which is detachably connected to a shaft extension, the end of which is provided with a pin that engages in a slot in the stem of the valve plug. This makes a flexible connection between the valve plug and the time mechanism, and also a detachable one which will permit the removal of the time mechanism from the casing without disturbing the valve.

The time of operation of the gearing is controlled by time mechanism (of any suitable construction) arranged to operate the gearing at predetermined times in a well-known manner.

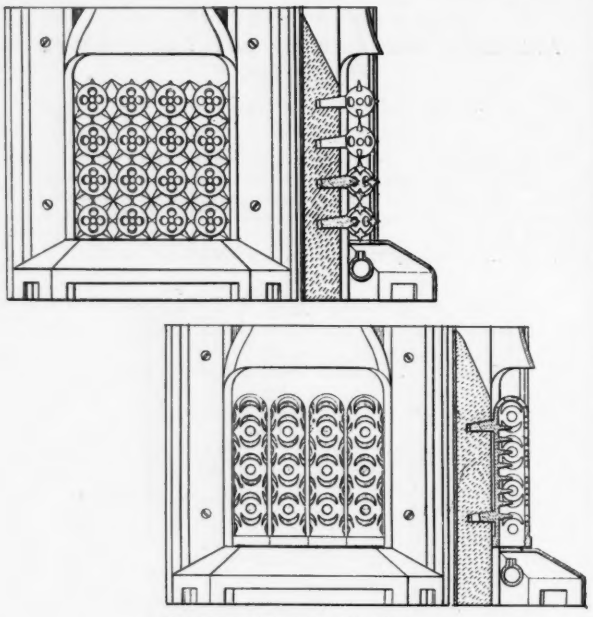
Gas-Fires.

CLAYTON, R., and CRUMP, E. B., of Bilston.

No. 959; Jan. 12, 1912.

This invention relates to gas-fires in which the incandescent fire-clay radiants or fuel are independently and individually supported upon the front face, sides, or ends of the deflector back of the gas-fire, by means of substantially horizontal taper pegs (either integral with the fuel or separate), which fit into corresponding taper sockets in the deflector back of the grate.

The illustrations show a front elevation of two forms of gas-fire in which the radiants are secured to the deflector-back in accordance with this invention.



Clayton and Crump's Gas-Fires.

In the first, each of the radiants or fuel units (which may be of hollow basket or other form) is provided at the back with an integral peg or stalk of taper formation and extending rearwards at a slight inclination. The deflector back of the fire is provided, at suitable positions, with holes or recesses of similar taper, into which the pegs or stalks of the radiants are inserted so as to securely fix the latter in position upon the deflector back. The radiants are arranged in rows one above the other or otherwise, as most suitable. When in use, it is said not only the radiants themselves become incandescent, but also the pegs or stalks, "which thus assist in the radiation of the heat."

Where radiants of the pillar type are employed, as in the second arrangement, each of the radiants is provided with a pair of attachment pegs, to take into correspondingly shaped holes or sockets. The inner face of the back of the radiant is provided with a number of spikes, "in order that the fuel may more quickly become incandescent."

Separation of Tar and Ammonium Chloride in Gases Produced by Distilling Coal.

BROUGHAM, F. J.; a communication from SOLVAY ET CIE, of Brussels.

No. 2857; Feb. 3, 1912.

This invention relates to the "separation of tar and ammonium chloride contained in gases produced by distilling coal in coke-ovens and gas-works."

The inventors point out that by the use of the apparatus described in patent No. 7915 of 1910—in which the gases produced by distilling coal are washed with tar in a bubbling column or gas-scrubber—the tar contained in the gases can be easily removed and the saturation of the ammonia—that is to say, the combination of the ammonia with acid to form a salt—can then be easily effected by direct washing of the gases in sulphuric acid after the tar is removed. The apparatus described in the 1910 specification enables different temperatures to be obtained in the different superposed sections or compartments of the bubbling column or scrubber; and, by suitably regulating the temperatures, a practically anhydrous tar can be withdrawn direct from the treated gases—"the commercial value of such tar being greater than that of tar which contains water." Such a method of working has, however, a disadvantage, in that the separation of ammonia already in combination in the gases as ammonium chloride and which condenses with the tar in quantity which is variable and (in the case of certain coals) often considerable, is "a delicate operation requiring special manipulation and only giving imperfect results."

The object of the present invention is to obviate this disadvantage. According to it, the ammonium chloride is separated in a solid state from the gas previous to the introduction of the latter into the apparatus for removing the tar.

The specification continues: Since the apparatus directly receives the tar which is already condensed in the hydraulic main, all separation or sublimation ("condensation of the ammonium chloride") therein should be avoided; and this may be effected by preventing the local causes of cooling. On the other hand, notwithstanding the large gaseous volumes to be treated, and the well-known considerable vapour tension of ammonium chloride, it is necessary to prevent any of the ammonium chloride being carried along by the gases. Now it has been ascertained that if the gases issuing from the hydraulic main are cooled on their way to the tar-removing apparatus to a temperature which may vary from 180° to 120° C., according to the amount of chloride contained in the gases, a small portion of the tar will be deposited, and, owing probably to its vesicular state, carry with it the particles of ammonium chloride which it retains completely. From this, it will be understood that it is sufficient to avoid all condensation of the ammonium chloride in the hydraulic main in order to be able to effect the total condensation of it into a solid state in a cooling apparatus of any suitable kind placed between the hydraulic main and the apparatus for removing the tar. In order to facilitate the removal of the condensed salt by washing or otherwise, two coolers may be used, so arranged that the salt may be removed from one while the other is working.

The general working of the process may therefore be as follows: The gases pass through the hydraulic main, which is maintained by a suitable jacket at a temperature sufficiently high to prevent any condensation of the ammonium chloride. The gases then pass into a cooler, where their temperature is lowered to from 180° to 120° C., so that the ammonium chloride which they contain is deposited therein. The gases are then led to the tar-removing apparatus, whence they pass to the sulphuric acid saturator.

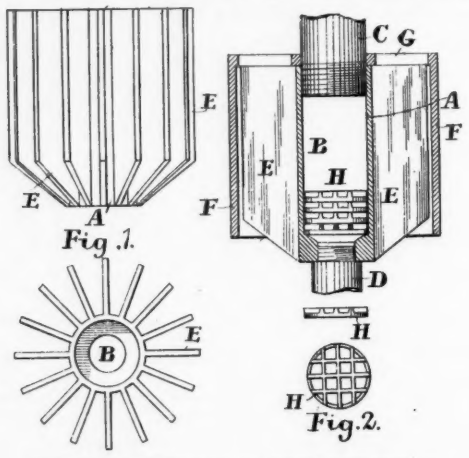
The process thus permits of "the direct recovery of the ammonium chloride in the solid state independently of the recovery of an anhydrous tar of a quality superior to that of ordinary tar."

Superheater for Use with Inverted Incandescent Gas-Burners.

CARPENTER, C. C., of Old Kent Road, S.E.

No. 3037; Feb. 6, 1912.

This invention has reference to chambers in which the air and gas are heated on their way to the burners of inverted incandescent gas-lamps. The arrangement consists of a central passage provided externally with gills or fins, and containing within it a number of perforated plates or grids; the whole being enclosed in a chimney or flue of refractory material through which the heated products of combustion escape.



Carpenter's Superheater for Incandescent Burners.

Fig. 1 is a side elevation and plan of the superheater. Fig. 2 shows the attachment of the superheater to the Bunsen tube and to the burner, the surrounding chimney or flue, and a few of the internal gratings—also shown detached in side elevation and plan.

A is the superheater consisting of a metallic casting and comprising a central passage B, with gills or fins E extending radially from it. The central passage is attached to the bunsen tube C, and the head D of the burner is attached at the opposite end of the passage. F is a tube of refractory material surrounding the superheater, and forming a chimney for the heated products of combustion leaving the burner. It may be supported (for instance) by radial arms G extending towards the bunsen tube. H are grids of metal made to fit the passage B, into which they are loosely dropped so as to rest upon the lower contracted portion, and the passage may be filled to any extent with the grids. The heated products pass up the flue and heat the gills by passing between them; and the gills convey the heat to the passage B and to the grids. Thus the gas and air passing through the grids become thoroughly mixed, and are also heated by intimate contact with them.

Sight-Feed Liquid-Flow Indicator.

WILTON, G., of Hendon.

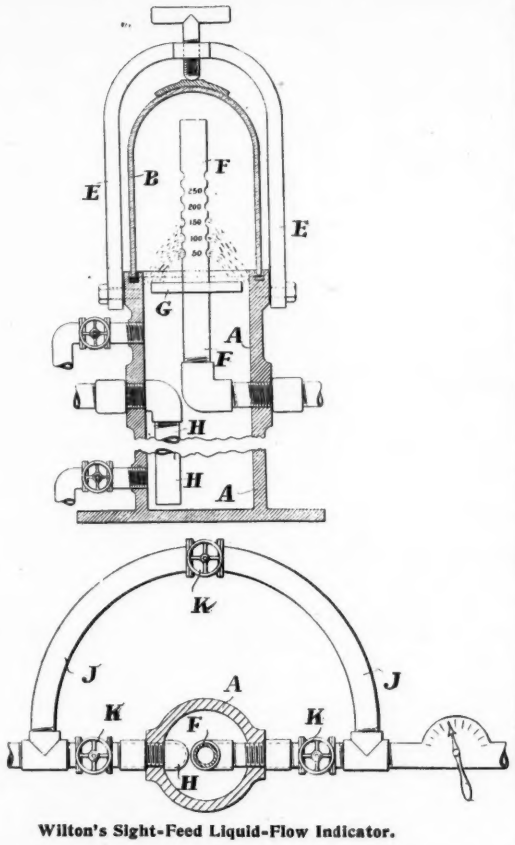
No. 10,151; April 29, 1912.

This invention is particularly applicable for indicating the flow of liquor (which usually takes place under pressure) into apparatus em-

ployed in gas plant, where it is desired to ascertain at a glance the amount being fed into the apparatus.

In the apparatus a vertical discharge pipe is employed with a series of perforations in it, whereby the number of holes passing liquid indicates the quantity flowing through the pipe. This weir is enclosed by a glass frame or bell adapted to be clamped air-tight upon a base into which the overflowing liquid is discharged—the base being made of sufficient dimensions and depth to prevent the glass bed or frame from being flooded. Also, if required (in order to withdraw the liquor without extracting the air or gas in the chamber), the liquor is drawn off from the bottom of the receptacle in the base, either directly or through the medium of a pipe or partition extending from the discharge down into the base well below the level of the liquid therein.

The illustration shows a vertical section and a plan of the bye-pass. A is a cylindrical casing closed at one end and provided with flanges to form a base. The upper and open end is enclosed in an inverted glass bell B, on a packing ring, and held in position by a pressure-screw at the upper end of an arched frame E, bolted at its lower end to the casing. F is a liquid supply pipe, projecting vertically upwards inside the glass bell, so as to be visible through it. The sides of the pipe, where it comes above the lower edge of the bell, are perforated with a series of holes—each gauged to pass a certain quantity of liquid in a given time. As the volume of water passing from the pipe increases, so more of the perforations become operative; and an indication of the increase is at once apparent.



Wilton's Sight-Feed Liquid-Flow Indicator.

The chamber below the perforations is made of large dimensions and depth in relation to the pipe F, in order that the quantity of water passing through may be led away without flooding the apparatus.

If required, a splash-plate G may be fitted below the perforations; and the discharge pipe H may be curved down to the base of the chamber. Means are provided (such as pipes J and cocks K) to bye-pass the measuring device for cleaning purposes, or for restoring the normal internal conditions should flooding take place; and for this purpose also upper and lower cocks are provided.

APPLICATIONS FOR LETTERS PATENT.

16,997.—KEITH, J. & G., "Gas-heated hollow-ware." July 22.

17,001.—JONES, E. V., "Lighting-device." July 22.

17,002.—POTTER, W. G., "Up-and-down burners, one being inverted and the other being upright." July 22.

17,032.—ROYSTON, E. R., "Flexible joints." A communication from General Reduction Gas and Bye-Products Company. July 22.

17,054.—TODMAN, J. C. T., "Controlling the flow of liquids or gases." July 22.

17,102.—ROSE, A., and BELLAMY, W., "Holder for inverted globes." July 23.

17,131.—REHMANN, H., "Regenerative furnace." July 23.

17,139.—SOUSTROU, E., "Pipe-unions." July 23.

17,179.—WILSON, H. W., "Petrol air-gas generators." July 24.

17,196.—NEWBIGGING, J. G., and THORP, F., "Time-recording device for lamps, stoves, and the like." July 24.

17,222.—KILBURN, B. E. D., "Calorimeters." A communication from the firm of Geb. Sulzer. July 24.

17,241.—SELAS LIGHTING COMPANY, LIMITED, and BROWN, T., "Burners for furnaces." July 24.

17,405.—MAROT, E. M. P., "Gas-generators." July 26.

17,425.—HERR, H. T., "Pressure-regulating devices." July 26.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Sulphate of Ammonia Market.

SIR,—We feel it only right to thank you for the kind way you brought the work of this Committee before your readers last week.

We think our work has done much, and will do more, to find fresh outlets for sulphate of ammonia, though there are a good many ammoniacal liquor manufacturers who do not yet subscribe to our funds. Therefore we naturally very much appreciate your kind action, in which you bring our work to the notice of these people.

Looking at the Alkali Inspector's report and the remarks which some trade papers are making on the same, it would appear as if the consumption of sulphate of ammonia for home purposes had decreased by 1500 tons as compared with the previous year. This, however, seems to be erroneous, as the following figures will show:—

		1910.		1911.
Total make	tons	367,587	..	384,976
Total exports . . .	,,	283,772	..	291,883
Used at home . . .	,,	83,815	..	93,093

There is actually an increase of 9278 tons.

If an erroneous idea got about, it would do our work harm; and we shall therefore be obliged if you will kindly point this out.

THE SULPHATE OF AMMONIA COMMITTEE,
T. MILNE, Chairman.

4, *Fenchurch Avenue, E.C., July* 31, 1912.

P.S.—The stocks would be practically the same both years.

National Insurance Act, 1911. Part II.

SIR,—The Sub-Committee of this Association consider that it would be desirable, in the interests of gas undertakings, if any questions which might arise respecting the applicability of Part II. to the employment of any workmen employed in gas-works, were made to them, instead of to the Umpire, so as possibly to avoid the furnishing to him of incorrect and insufficient information.

FRED E. COOPER, Secretary.
Gas Companies' Protection Association.

5, *Victoria Street, S.W., July* 29, 1912.

SIR,—As is now generally very well known among gas companies' officials, certain grades of employment do not come under Part II. (Unemployment Insurance) of the National Insurance Act, 1911, as "insured trades." Therefore when any employee is not working at an insured trade, the employer or employee, I assume, will not be responsible for any weekly subscriptions for that particular week. But it has occurred to me that, owing to the nature of the work in a gas-works, it is possible and very probable that a man may work at an insured trade one week, and therefore should be insured under the Act, but may not work again at an insured trade for an indefinite period. Under such circumstances, What position should a gas company take up respecting their subscriptions; and what would be required from the workmen to be able, when necessity occurs for them, to claim unemployment benefit?

If the employer is not responsible for subscriptions when an employee is not working in an "insured trade," I assume, if the workpeople desire the full benefit under this part of the Act, that they should pay the 5d. per week themselves.

I shall be glad and greatly obliged for any information you can give dealing with my questions.

ENQUIRER.

July 29, 1912.

LEGAL INTELLIGENCE.

SEQUEL TO THE LISBURN GAS-WORKS PURCHASE.

At the Belfast City Assizes a few days ago, before Mr. Justice Dodd, an action was brought against the Lisburn Rural District Council by the Lisburn Gas Company, Limited, who claimed £306 18s., of which £211 10s. 1d. was for work and labour done, material supplied, and money expended; £15 10s. 2d. was for interest on the latter amount; and £79 17s. 9d. was money due by the defendants to the plaintiffs on an apportionment account agreed to between them at the time of taking over the gas-works, and for money expended for the use of the defendants at their request. Defendants admitted their liability to the extent of £230 16s. 9d.; and this sum was paid into Court. They, however, counterclaimed for £50 for the detention of maps and plans of mains and pipes; £90 insurance received by the plaintiffs in respect of the burning of a house, which was part of the undertaking sold, prior to the passing of the Act authorizing the purchase; and £22 14s. 11d. in respect of rates and rents.

Mr. D. M. WATSON, K.C., and Mr. J. ANDREWS appeared for the plaintiffs; Mr. A. H. BATES, K.C., and Mr. J. M. WHITAKER represented the defendants.

At the close of the evidence, his Lordship reserved judgment, which he delivered two days later. In the course of it he said that the action arose out of the sale by the plaintiffs as a gas company to the defendants as an urban sanitary authority. The sale was brought about by an Act of Parliament, which laid down the principles and procedure on which the matter was to be carried out; but the Act did not vest the undertaking in the defendants. The transaction was to be carried out by arrangements and dealings between the parties; and a deed was required to complete the transfer of the property. The purchase was completed on Dec. 31, 1910—the price paid for the undertaking being £33,000; but what he ventured to call the adjustment money was held

over, at the request of the Council, till the second Monday in the following February. Unless there was some satisfactory restriction or some rule of law preventing it from being binding upon a public body, the transaction was closed. It was alleged that there was both a statutory restriction and a rule of law. The latter was that the meaning of a word or term in a contract could not be interpreted by the subsequent conduct of the parties to it. The Act of Parliament set forth that the Company should pay the purchase money on such a day as might be agreed upon. "The Company," it was stated, "shall bear and pay all outgoings of every kind, and shall be entitled to all receipts from their said undertaking up to the date of transfer." The word outgoings" had a definite meaning, but, so far as he could find, there was no case where the word had a definite meaning in the sale of a commercial undertaking as a going concern. For himself, he had no doubt that business men in such a case acted upon the basis that every liability was apportioned and adjusted. He regarded the sums agreed to be paid on the first Monday in February as if, in fact, they had been paid on the 31st of December; and that, in law as well as in justice, the whole deal was closed. He was satisfied that, after the agreement as to price, the Council could not ask for the £90 in their claim.

His Lordship gave judgment for the full amount claimed, with costs, and also judgment for the plaintiffs on the defendants' counterclaim; and he made an order to pay out all sums lodged in Court.

On the application of Mr. Bates, stay of execution was granted.

THE CANADIAN "NATURAL GAS" ACTION.

Judgment was given by the Judicial Committee of the Privy Council last Wednesday in an appeal by certain oil and gas companies against a decision of the Court of Appeal of Canada in an action originally brought to determine the true construction of a clause in a deed under which Mr. Alexander Farquharson became, in 1867, the owner in fee simple, from the Canada Company, of 100 acres of land at Tilbury, in the Province of Ontario. The clause in question excepted "all mines and quarries of metals and minerals, and all springs of oil in or under the land, whether already discovered or not," which were reserved for the Company. The Court of Appeal, affirming a judgment given in the Court below, decided that natural gas did not fall within the term "minerals" used in the reservation. The facts and a summary of the arguments were given in the "JOURNAL" for the 23rd ult. (p. 275).

In giving their Lordships' judgment, Lord Atkinson said the sole question for decision was: "Did the clause exempt from the grant the natural gas which impregnated certain underlying strata of the lands?" The case did not require a definition of "minerals" to be laid down, but only the ascertainment of the intention of the parties who used the language. In one sense, natural gas, like rock oil, was a mineral, inasmuch as it was neither an animal nor a vegetable product. But in the clause, the word "minerals" was not used in this wide sense, for "metals" and "springs of oil" were specifically mentioned, and the terms in which the operations were described—"the working, winning, and carrying away"—were inapplicable to natural gas. The expression "springs of oil" could not be held to cover natural gas, simply because both were often found to impregnate the same stratum. Oil-mining leases in Canada only began to be made in 1863; and till 1890 the presence of natural gas was considered a dangerous and destructive element, to be got rid of in the best possible way. It was not till 1890 that the gas came to be utilized. The parties never intended to cover by the term "springs of oil" the then worthless product "gas."

Their Lordships agreed unanimously with the judgments of the Canadian Courts in favour of the respondent, and decided that the appeal should be dismissed, with costs.

ASSESSMENT OF WATER-WORKS FOR INCOME-TAX.

In the Court of Appeal last Wednesday, judgment was delivered in the appeal by Mr. J. W. Hall, a Surveyor of Taxes, from the decision of Mr. Justice Hamilton in a case in which the Income-Tax Commissioners had affirmed a claim to assess the Wakefield Rural District Council at a sum of £347 10s. in respect of their water-works, whereas the Council held that the amount should have been only £104 10s. The case was noticed last week (p. 336).

In delivering judgment, the Master of the Rolls said that separate accounts were required by law to be kept for the water supply in each contributory place in the Council's area of supply. They had no power to divert, and, as a matter of fact, had never diverted, the profits arising from water supply in any parish, or levied any deficiency rate other than in the parish where the deficiency occurred, but had always carried forward any surplus to the credit of the parish where it arose. In his Lordship's opinion, this showed that they had done precisely what was their legal duty. It seemed to him that, in face of this, it was very difficult to contend that the water supplies were not separate concerns. He thought that for each contributory parish which made a profit the Council ought to pay income-tax, and debit the amount against the particular parish. The appeal on the part of the Crown ought, therefore, to be allowed, with costs.

Lords Justices Farwell and Kennedy concurred.

Salford Gas Order.

The Local Government Provisional Orders (No. 10) Confirmation Bill was sent forward for third reading by the Unopposed Bills Committee of the House of Lords last Tuesday. It includes the Salford Gas Order, which, as already pointed out in the "JOURNAL" when it was before the House of Commons, disposes of the long-standing dispute between the Salford Corporation and the outside authorities. Since the Salford Order was before the House of Commons, a petition was presented against it by the United Alkali Manufacturers' Association, and it was placed in a group to come before a Committee dealing with Opposed Bills. Subsequently, however, the Corporation agreed to the insertion of what is known as the Ritchie chemical clause.

MISCELLANEOUS NEWS.

ZÜRICH GAS UNDERTAKING.

Report and Accounts for the Year 1911.

We have received from Herr A. Weiss, the Engineer and Manager of the Zürich Gas-Works, a copy of the report and accounts of the Corporation gas undertaking for the twelve months ended Nov. 30, 1911. The following are the items of more general interest in the report.

The roof of the No. 1 retort-house has been raised in view of the forthcoming replacement of the settings in this house by settings having a greater productive capacity. The roof ventilation has at the same time been improved. Concrete channels have been made for all the steam-mains on the works. The physical laboratory, which was constructed in the previous year, has been brought into use. Various schemes for preventing flooding of the gas-works when the River Limmat is in flood have been considered; but none of them has yet been carried out. The undertaking has joined the Swiss Gas-Works' Inspectorate, the object of which is to make rules for the safe construction and working of gas-works. The thirty-two settings of nine inclined retorts in the No. 1 house have been in action for 7801 setting-days; and the ten settings of ten vertical retorts in the No. 2 house, for 2897 setting-days.

The total amount of coal carbonized in the year was 97,548 metric tons (about 95,987 tons), and of cannel 320 metric tons (about 315 tons). The total make of gas was 33,669,100 cubic metres (about 1189 million cubic feet). The average make of gas per ton of coal carbonized was therefore 12,344 cubic feet, compared with 12,287 cubic feet per ton in 1910. The make in the inclined retorts was 11,511 cubic feet per ton of coal, and in the vertical retorts (with steaming) 14,349 cubic feet. These figures show an improvement on the previous year's working, especially in regard to the vertical retorts. The coal carbonized was exclusively German. Long-term contracts have been concluded with the coal suppliers during the year; but the reduction in price obtained in these contracts will not have its full effect until the current year. The average cost of coal delivered into the retort-houses was 25s. 7d. per ton, as compared with 27s. 4d. in 1910. The production of gas for the year shows an increase of 4·40 per cent. compared with 1910.

There was an appreciable reduction in the make of gas per shift per setting-day, and per retort-day, as compared with the previous year, owing to two benches of vertical retort-settings having been under reconstruction during the year. The wages per 1000 cubic feet of gas made were also on this account higher—viz., 1·78d. compared with 1·69d. in 1910. There was an increase of 3·03 per cent. in the quantity of gas sold to private consumers. Since Aug. 15 last, gas has been supplied at the uniform price of 17½ centimes per cubic metre (about 4s. per 1000 cubic feet) for all purposes; whereas previously differential prices were in vogue, according to the purpose for which the gas was used. The maximum output of gas in twenty-four hours was 4,647,586 cubic feet on Dec. 23, 1910. There was a slight falling off in the quantity consumed per head of the population. The gas consumed by places outside the town boundary, but supplied from the Corporation works, amounted to 5·22 per cent. of the total consumption; showing an increase of 13·01 per cent. in the gas consumed in these outlying districts as compared with 1910.

The coke consumed as fuel under the retort-settings amounted to 14 per cent. by weight of the coal carbonized in the inclined retorts, and 15 per cent. of the coal carbonized with steaming in the vertical retorts. The average consumption of coke per 1000 cubic feet of gas made was 25·95 lbs. A somewhat smaller average price was obtained for coke than in the previous year, owing to the reduction in the make of vertical retort coke in consequence of the reconstruction of the settings. This coke fetches a higher price than that from the inclined retorts. The make of bye-products, in percentages by weight of the coal carbonized, averaged as follows: Real ammonia, 0·2118; tar and pitch, 6·89; clinker, 3·76; scurf, 0·059; Prussian blue, 0·060. The make of ammonia is appreciably lower than in the previous year; but an increased make of most of the other bye-products was obtained. Good prices were realized for bye-products, especially ammonia. The profit, however, on cyanogen products has diminished so much that it is doubtful whether it now pays to produce them. The newer of the two sets of purifiers was re-charged with Lux material; and the spent Lux material contained, after drying by exposure to the air, 57·5 per cent. of sulphur, 1·2 per cent. of Prussian blue, and 0·1 per cent. of ammonia. The purifiers of the old set, which had been charged with equal parts of Lux material and Dutch bog ore, were not re-charged during the year; the mixture having sufficed for the purification of twice as much gas as unmixed bog ore would have purified. The mean net calorific power of the gas distributed was 521 B.Th.U. per cubic foot, at 60° Fahr., 30 inches, and saturated. The gas distributed contained on the average 6·6 grains of cyanogen and 0·031 grain of ammonia per 100 cubic feet. No English coal having been carbonized during the year, the amount of sulphur in the gas supplied was only slightly over 13·0 grains per 100 cubic feet. A number of tests of coal were carried out in the experimental plant, and many tests of products and materials were made in the chemical laboratory. The new photometer room, which has been equipped with apparatus for determining the illuminating power of gas burners and mantles of all sizes, and also of electric lamps, was brought into use during the year.

The two benches of vertical retort-settings were let down, after an average of 1234 days' use, for renewal of the retorts. Opportunity was taken to make improvements in the settings, with the object of securing more uniform heating of the retorts. The number of public lamps in use was 6867, containing 8862 burners. Of these lamps, six were provided with high-pressure inverted burners. Automatic lighting and extinguishing apparatus was fitted at the close of the year to 2070 burners. The consumption of mantles per street lamp averaged 6·94 per burner per annum. The accounts show a total net profit on the year's working of 1,348,654·45 frs. (about £53,946), which is very slightly less than the net profit for the preceding year.

THE GASLIGHT AND COKE COMPANY.

The Two Hundred and First Half-Yearly Ordinary General Meeting of the Proprietors was held last Friday, at the Chief Office, Horseferry Road, Westminster—Mr. CORBET WOODALL (the Governor) in the chair.

The SECRETARY (Mr. Henry Rayner) read the notice convening the meeting; and the seal of the Company having been affixed to the Register of Proprietors, the report (given in the "JOURNAL" last week) was taken as read.

COAL STRIKE AND ITS EFFECT.

The GOVERNOR: Six months ago we held our meeting under circumstances of considerable uncertainty, I may say of anxiety, as to the future. We were looking forward to the possibility of a suspension of work at the coal mines, and to the certainty, strike or no strike, of dearer coal. We hoped the former might be averted; the latter we knew to be inevitable. Notwithstanding the unfavourable outlook, your Directors had decided to reduce the price of gas as from the previous Christmas, being convinced that such action on their part would at the time be specially welcome to the public (the consumers of our gas), and that the financial position of the Company was strong enough to afford reasonable security that we should not need to retrace our steps. As you are aware, our hopes were disappointed, the strike was decided on, and our supplies were practically suspended for some six weeks. During this time our stocks were heavily drawn upon. Coal which had lain in store-rooms, some of it for eight or ten years, came at last to the retorts, and a certain quantity, some of it sad rubbish, was obtained from various outside sources. But we had the very great advantage of being able largely to increase the quantity of oil gas sent out. This involved the withdrawing of much coke from the market; but we maintained a supply for domestic use and for such industrial purposes as were most essential. By these means we were able to give a full supply of gas to all consumers, and were never in any real anxiety as to its continuance. Still, the cost was considerable; and we are feeling the burden now more than during the continuance of the strike. The influence of this disturbance of our ordinary methods will be seen as we examine the accounts, which I will now proceed to do.

THE CAPITAL ACCOUNT.

The capital account (No. 3) shows a total sum spent in the half year of £66,448. The analysis before you is hardly sufficiently explicit, because in the item "Buildings and Machinery" (£15,154) is included the first payments on account of a new investment—the Company's first steamship. These payments amounted to £7550, and leave only £7604 as spent on ordinary works and plant. We hope to have this ship conveying coal to Beckton in October next. The boat will carry 3400 tons, and we confidently expect she will prove a source of profit. The balance of capital expenditure (£51,000) is accounted for by new mains, services, meters, and stoves. As credits, we have a small sum for land sold, and for depreciation of plant, including meters and stoves, £72,400. The result is that the total amount of capital employed is not increased, but reduced by £8000. The absorption of the Barking and Chigwell Companies has added £278,858, a portion of which, representing the buildings and plant dismantled and replaced at Beckton, will be written-off in due course. While the capital is still heavy in relation to business done, steady progress is being made towards a healthier condition. Within the past six years, the Company have been very careful with regard to the expenditure of capital. During that period, land has been sold to the extent of £102,000; and, after taking credit for this sum, the net capital expenditure amounts to only £107,000, which, divided by the increased quantity of gas sold for the six years, gives an average of 11d. per 1000 cubic feet, as compared with the average capital expenditure of the Company to date, of 11s. 4d. per 1000 cubic feet. The redemption fund created under the Act of 1903 has helped in this direction to the extent of £168,000.

SPECIAL POINTS IN THE REVENUE ACCOUNT.

Turning, now, to the revenue account, you will bear in mind that the reduction in price which took effect at the commencement of the half year cut our profit to the extent of £58,000, and added to the co-partners' bonus £6000, or £64,000 in all. There have also been certain special expenses arising from the amalgamations—viz., £15,900 for retiring allowances to Directors and officers, and £6000 paid as compensation for back-dividends to shareholders of the Barking Company. The Centenary celebrations are represented by an item in the net revenue account of £5580. We have again paid to the special purposes fund £20,000; and the contribution of £15,000 for the half year has been earmarked in the proposed appropriation (in accordance with the requirement of the Company's Act of 1903) to the redemption fund. All these charges have been met, and we have, after paying debenture interest and dividend on preference stock, a balance profit on the half year of £428,000.

HIGHER DIVIDEND.

The Directors propose that the dividend to which the stockholders are entitled while the price of gas is 2s. 6d. per 1000 feet—viz., £4 17s. 4d. per cent.—be declared and paid. If this recommendation be adopted, we shall carry forward, as a balance of net revenue, £768,407; being £54,000 more than at this time last year, or £28,600 in excess of the balance at Christmas last for the three Companies. I think this statement of the broad results of the half-year's operations will be regarded as satisfactory, and as justifying the last reduction in the price of gas.

HIGHER COAL AND COKE PRICES.

Our coal contracts for the current year have been made at prices grievously in excess of those just expired; and steamship freights are also higher. Together, these will cost approximately £270,000 for the twelve months to June, 1913. Against this large sum there will be some credit for higher priced coke, &c.; but the burden remaining will be a heavy one. Because of this, it is hardly probable that we shall further reduce the price of gas next year; but it is certain we shall not raise it. In the current year we may need to draw somewhat on our reserves; but as these amount to over three-quarters of a million sterling, this need cause us little concern.

VARIATIONS IN RECEIPTS AND EXPENSES.

A few details of the revenue account will be interesting. The gas sold shows an increase of nearly 2 per cent. (representing £32,000 of revenue), which, considering the abnormally fine weather prevailing in the spring, betters our expectations. Rents for meters, stoves, and fittings are more by £19,800. With regard to the increase of 2 per cent., there is no doubt whatever that a certain proportion of this was due to the strike. Knowing that the supply of fuel was available from the Gas Company, a great many people more than usual adopted gas-fires; and these having been once fixed we have no fear that they will be returned on our hands. Less coal was used by 74,000 tons—oil and coke taking its place. As these latter produce practically no residuals, the quantity of coke and other bye-products made for sale was proportionately reduced. Allowing for these unusual circumstances, the net cost of raw materials yet shows a saving as compared with last year of £40,000. Against these gains has to be set the loss by reduction in the price of gas (£58,000), and an increase in distribution charges of £43,000. The expenses of this department must necessarily grow as the number of meters and other consumers' appliances continues to multiply. We have had, moreover, in the past half year a number of special charges in relation to show-rooms and district offices which have helped to swell the distribution costs. It is satisfactory to note that bad debts have been reduced by £1400. I do not think I mentioned that the extra cost of coal purchased to take the place of what could not be delivered during the strike has been charged against the special purposes fund. This is one of the uses for which the fund was instituted. Co-partnership is doing well, I think, from every point of view. The number interested is now 9650, and the amount invested £92,705.

A NEW VALUABLE FIELD FOR ENTERPRISE.

The report mentions that the amalgamation of the Barking and Chigwell Companies was successfully carried through on Jan. 1. We feel sure that the acquisition of these large districts, although the demand for gas within them is at present but small, will in future form a valuable field for the Company's enterprise. I am glad to say the consumers of gas in these districts are well pleased with the services rendered them by the Company, and that additional connections to the mains are being made at an increasing and rapid rate.

NATIONAL INSURANCE ACT AND PROVIDENT CLUBS.

An approved society under the National Insurance Act has been formed among the employees of the Company—the membership reaching 9500. In addition to this, the Directors have arranged, at the request of the men, to continue the two old provident clubs (fused into one) in the form of a supplemental society. The men pay to this an extra 2½d. per week—making 6½d., against the 4d. required under the Act; and by this means they will continue to enjoy the benefits of the clubs so far as they were in excess of those attaching to the Government scheme. About 700 men are enrolled under the unemployment section of the Act.

FOLLY OF INDUSTRIAL WAR.

Reference is made in the report to the two strikes which seriously interfered with commerce and industry during the half year, and are still affecting so injuriously, not only our undertaking but the country generally. In February, I tried to point out the folly of deferring arbitration, inevitable eventually, till after the waste and ill-blood of an industrial war. Unhappily, bellicose counsels prevailed, and a general strike of the coal workers of the whole country was declared. This new and formidable weapon did not ensure success. The country bore with fortitude considerable privation, and eventually the questions in dispute were referred to arbitrators. We passed through the period of the stoppage without serious difficulty it is true; but it would be folly to say that we, or the community we serve, escaped scatheless from the, so far as outsiders were concerned, unprovoked disturbance. It is true that London did not suffer noticeably from anything like a real shortage of fuel; but still there was a heavy bill of costs piled up, which the public, or coal consumers, are now called upon to liquidate. Strikes generally seem to me a huge and stupid blunder. The men lose wages and spend the savings that should have remained in reserve for a rainy day; these are permanent losses. The employers stand out of profits, for a time. Prices go up to the public, who have to pay the lion's share. I know how unstable is the ground underneath the outsider, who roundly blames the middleman or the manufacturer or producer, as the case may be, for putting up the price of coal or other commodity at the first wind of labour troubles. After all, it is the traders "nature to;" and as individuals in their place, I fear we should all be sorely tempted to do likewise. Yet I firmly believe it is a mistaken policy to insist upon the payment of the uttermost penny which such circumstances render possible. By so doing the users (the public), who have already suffered heavily, are made to bear still more, in order that one party to the strife may enjoy a "boom" year. Such action not only demoralizes the workmen, but, by burdening the industry and commerce of the country, brings about a speedy check to the demand and consequent fall of prices, which may soon outweigh the extravagant profits of a short period. If we could but put the country first in our calculations, how much it would simplify the settlement of individual claims of employers and workers.

THE VALUE OF THE SLIDING-SCALE TO ALL—CO-PARTNERSHIP AND A MERRY ENGLAND.

Our own sliding-scale, I think, is a useful lesson in fair dealing. It shows us that the cheapening of the output is the true measure of increased profitableness, however it may be decided to share the gains among the various claimants. We pay the fullest wages and give, in addition, advantages—apart from co-partnership—greater than most industries afford. We also, at present, pay rising dividends. But our price of gas is reduced, not increased, *pari passu* with these internal

benefits. I have no intention at all at this time of repeating what I have already advanced more than once respecting the merit of co-partnership; but I wish those prophets of evil, and disparagers of their times and country, who appear to look upon the British workman as an unreasoning being of different flesh and blood from their own, had seen our Centenary party at the Crystal Palace last month. They would have agreed that for that bright, happy, well-behaved company at least the idea of a Merry England was not a mere tradition of a more or less mythical past, but a reality of the present day. It would have been vain to look for signs of unrest there. This notwithstanding, no one having the interests of the country at heart can fail to admit that we live in trying times, and we must welcome the intimation that the Government are taking steps to render impossible in future such factious and irrational interruptions of trade as that from which we are only now being delivered. To put both parties to an industrial bargain under penalty for its fulfilment is a logical step, just as it is in any other business arrangement. I read the other day some words spoken by the Member for Barnard Castle, a well-known labour leader. He said, speaking with a full sense of responsibility, "that wherever they had had the opportunity of meeting the employers, they had done more for those they represented than was ever gained by any strike. That might not be very palatable; but it was the outcome of twenty-eight years' experience at that sort of work. The 'down tool' policy was going to destroy the old policy of recognition." Reading this together with the proposal of the Government, one is encouraged to hope that the dark night of strife and distrust is yielding place to a morning of reason and mutual consideration and good-will.

CENTENARY REFLECTIONS.

To turn to a more pleasant topic. I wish here to place it upon record that the unique event of the Company's Centenary has been celebrated since our last meeting to, I believe, the great and general content of all the Company's employees of every grade. I am sure that what we have done in this respect has had the effect of inspiring all the men, including their families, with an affection for, and loyalty to, the Company which could not have been created in any other way. We met, whether at the Crystal Palace or the White City, as friends; and I am sure that none will forget, any more than I shall, the impression of the existence of hearty goodwill among all ranks which these gatherings gave the first opportunity in the history of the Company of showing. The general history of the Company throughout its first century is recorded, we trust readably, in the memorial volume which you have all received. It is a grave reflection for myself that I have lived through many of the more momentous of the later changes and epochs therein chronicled which have left their mark upon the Company, whether in regard to its expansion, its polity, or its internal order. In this connection, I should like to make an apology to my friend, Mr. William King, formerly Chief Engineer of the Liverpool United Gaslight Company. On page 73 of the book, we say that the transmission of gas in bulk by means of high-pressure first took place at our Beckton works. I find, however, that this was not the case, and that Mr. King pumped gas under pressure between two of the Liverpool works as early as the year 1867, at which date Beckton had not been inaugurated. Only very shortly before I became connected with the gas supply of London, the thirteen gas companies then providing this service were districted, and every individual company was thereupon left to prove its right to exist; and you know how the trial eventually ended. Even after the amalgamations had reduced the number of establishments, there long remained a vast deal of economical consolidation to carry out. The uneconomical old gas manufacturing stations, some occupying sites more valuable for other purposes and others surrounded by populous neighbourhoods, have been suppressed, and better stations developed in their stead; and gas has been cheapened on the whole as the net result. I think probably the most striking observation one can make with regard to the development of the Company—at any rate to those outside the circle of the managers—is the fact that, three years after the Company was established, the total quantity of coal used in the year was 4000 tons; and now, whether in coal or its equivalents, we use more than 10,000 tons in a single day. We have built up an enormous accessory business in consumers' fittings and appliances, and we are being rewarded with a daily heightening popularity with the community whom we serve. Among the ways in which the present is better than the past is, I think, the condition of the workers engaged, especially in carbonizing. By the introduction of machinery, much severe and exhausting labour has been dispensed with, and the general surroundings of the retort-houses greatly improved. This is not strictly a growth of one hundred years. That would be to compare the tree with the seed. I believe that momentous changes are in front of us; and I believe that the progress recorded in the past will be continued to the further prosperity of our Company.

OFFICIAL CHANGES.

It is customary for me, in my concluding remarks, to refer to any changes which may have taken place in the *personnel* of the head-quarters staff. A valued officer of the Company—Mr. John Hatchwell, the Registrar—has recently left us after 43 years of most useful and loyal service; and we wish him long enjoyment of the annuity he has so thoroughly earned. We believe that we have secured a competent successor in Mr. C. F. Fullbrook, who has had 22 years' experience of the important work of the Transfer Department.

ADOPTION OF THE REPORT AND ACCOUNTS.

I have now pleasure in moving: "That this meeting do agree with, and confirm, the report of the Directors and the Auditors' report and statement of the accounts of the Company as transmitted to the proprietors on the 25th ult."

The DEPUTY-GOVERNOR (Mr. Ulick J. Burke) seconded the motion.

REMARKS BY SHAREHOLDERS.

Mr. EDWARD KIMBER said all present must feel gratified for the extraordinary and very interesting address to which they had listened. The Directors were to be congratulated on having passed safely through six months of such strong weather. He thought it was most extraordinary that they should have succeeded so well as they had done. The Governor had told them there had been a diminution in the consumption of coal, but that they had been able to make it up with a supply of oil; but it appeared from the accounts that the supply of oil during the last half year was no less than 2,000,000 gallons in excess of the previous six months. If this had taken place throughout the whole country, it looked as though the day of coal was past, and that the age of oil was superseding it. At any rate, one thing was certain, that the Directors had found it necessary to compete in some measure with the carriers of coal; and he thought they had done wisely in ordering and getting constructed a ship for the purpose of conveying coal from the North of England to their works. He wished they would follow up this policy and obtain some tank-ships for the conveyance of oil. He had recently occasion to write to "The Times" as to the price of oil in different parts of the world, because it looked to him as though the carriers, the intermediate people, were gaining an enormous profit from the oil they brought to this country. He noticed that the Company paid only £1 12s. 6d. per ton for oil; but how they got it so cheaply he did not know—the Board must be remarkably clever. If they had tank ships to bring it from the other corners of the earth, they would save at least 5s. a ton. It was a fact that oil could be obtained in the Gulf of Mexico at something like 10s. a ton; and it could not cost 20s. a ton to carry it to this country. In the United States, oil could be obtained on the spot for something like 60 cents a barrel, or 17s. a ton—that was, crude petroleum.

The GOVERNOR said he was sorry to interrupt the speaker, but he would be glad if Mr. Kimber would keep as much as possible to the accounts of the Company.

Mr. KIMBER said he only meant it as an illustration. If his suggestion were adopted, they would find that the gas made from oil would not only be appreciated, but many economies would be effected; and the price of their stock would go up, because they would then show the world that they were on a very much safer footing than they were at present. Comparing these accounts with those of other gas companies, he thought the Gaslight and Coke Company were in a much better position than, and ahead of, all others.

Mr. W. A. HOUNSOM said his first words were of congratulation, which would be shared in by each individual present, that the Governor was in the chair, having survived the varying functions connected with the Centenary. He had been much struck, in following the proceedings of the last few months, to see the human side of things so well to the front; and he thought this was crystallized in a word used by the Governor at the Crystal Palace when he spoke of the workmen of this Company, their wives, and their potential wives. It seemed to him that with such a sentiment as this the human element came into the whole thing. They (the proprietors) were representing the capital side of the Company. True, it was not a large meeting, and he wished it had been larger; but, after all, numbers did not count for everything, and one could lay the flattering unction to one's soul that they had quality. Capital had had some hard knocks lately; but no doubt it would get more, and rightly too. If he had been speaking in the room a few years ago, it would have been impossible for him to link capital with the varied interests of the Company, as he wished to link it to-day. Capitalists then stood quite apart, and had but little interest in individuals round about them. Now, however, all this was changed, or was changing. They had not yet reached their goal; but the ideal set up was a lofty ideal—to satisfy their customers, in whom they had a great interest and to whom they wished to supply the best possible article and give information to enable them to use gas to the best possible advantage. They no longer spoke of the men as "hands"—they were workmen and co-partners. They went in their thousands to the Crystal Palace; and all those in the room were interested in the welfare of them. He rejoiced that this Company had taken its place—the place which it had not a few years ago—as the greatest Gas Company in this great country, who were at the head of the great ideals of co-operation and co-partnership, which had carried such blessings in their train. He was not oblivious of the fact that they met under the happy conditions of an extra dividend. They were all glad of this; but he ventured to say that, had they met under adverse conditions, they would have met these conditions in a different frame of mind than they could have done a comparatively few years ago. They were interested in the Company as a whole; and the influence of the Company was extremely great. They were not only the first Gas Company in the country, but they had such wide ramifications that thousands of homes were influenced by the Company to-day. He rejoiced that their influence had extended far and wide. But there was another reward—namely, that they hoped that, by-and-by, there would be not only co-operation among companies, but throughout the country, so as to render impossible, not only industrial strikes at home, but between ourselves and the world.

Sir JOHN RUNTZ was glad to be present at what was a record half year, when they had not only an increased dividend but the condition of the Company was more prosperous than ever. It was always difficult to follow figures; but the Company's capital was something like £29,000,000. This was a very great responsibility for Directors to turn over and make an extra profit on as they did. He found from the accounts that they had made a profit of £428,000, and he hoped it would soon be a round half million. But at any rate, £428,000 for a half year was extremely good; and he did not think any shareholder could grumble. The available balance was £1,167,000, out of which the dividend took £400,000; leaving £768,000 to be carried forward—nearly a full year's dividend at the present increased rate. This was very satisfactory. With regard to residuals, he remembered a year ago that someone said to the Chancellor of the Exchequer that the chemical market was the commercial barometer; and he hoped their residuals would go up, and that they would have great prosperity in the Company in the future. He congratulated the Directors and the shareholders on the present position of the Company, and he trusted they would never have a worse half year than the present.

Mr. WILLIAM KING said he first desired to thank the Governor for his very courteous and free acknowledgment of the priority of Liverpool in the pumping of gas. It was a very important matter; and when they resolved to pump gas from Beckton to London, Mr. Trewby consulted him on the project. If "imitation was the sincerest flattery," he presumed that what they did in Liverpool did not meet with

Mr. Trewby's disapproval, at all events. They felt delighted that a few days ago the staff presented the Governor with his likeness; and the Governor then referred to keeping memories green. He would not like this meeting to end without some allusion to those who had passed away—one being his old and venerated friend Mr. George Lowe, who for a great many years was Engineer to the Company, a leading man in the gas profession at the time, and of late years an intimate friend of his own. In "The Times" of July 17 last, appeared a whole sheet advertisement of this Company, and in the same issue appeared a most interesting account of the 250th meeting of the Royal Society. In their proceedings there was a dinner at the Guildhall; and the Prime Minister remarked that the letters "F.R.S." formed one of the proudest additions an Englishman could make to his name. His friend Mr. George Lowe was a member of the Royal Society; and he believed he was the only officer of a gas company who had attained this distinction. Mr. Lowe was also a member of the Council of the Institution of Civil Engineers and of the Franklin Institute in America—in fact, he was a man of renown. Therefore he would not like Mr. Lowe, Mr. Frederick Evans, Mr. Phillips, and others to be forgotten. He would never forget the many acts of kindness and the courtesy he had received from Mr. Lowe; and, having known him for, he would not like to say how many years, he hoped the meeting would pardon him for mentioning these facts.

Mr. C. E. Jones said he felt loth to let the occasion pass without adding his mite to the congratulation which the Board had so honestly deserved, and which had been so ably tendered. It had been his lot to be connected with the gas industry, not so long as his friend Mr. King, but for 56 years. His association with it had been such that he had seen many changes brought about during this time; but he considered this to be the most important meeting the Company had ever held. He agreed with Mr. King that we should not forget old friends; and those of them who were in the sere and yellow leaf thanked him very much for what he had done to build up, not only the industry of this Company, but other industries. While this Company taught the gas industry, it had created other industries—new industries entirely. One hundred years ago, the science of chemistry was in a moribund state; the introduction of gas gave it a new lease of life. To-day, synthetic chemistry had become a new service, and new industries were created by residual products, first brought into the market by this old Company. He need not remind them that this Company employed hundreds and thousands of people; it had developed the inventive genius not only of our own people but of the entire world; it had been educative, it had produced results for the enlightenment, the advancement of real social union, for the comfort and convenience of mankind. They had to thank the old Chartered Company—a name he was still proud of—for all this; and he was proud of the association of his connection with the Company. He would like to remind the proprietors, in addition to what Mr. King had said so eloquently, that the Governor had had the highest honour paid him by the gas profession that could be paid to any man on the face of the earth. The Institution of Gas Engineers of Great Britain had re-elected him to the chair of the Institution. He considered this was nothing more than a proper recognition of the Governor's scientific attainments, and showed the great respect in which he was held by everybody who knew him. But he thought some of the lustre and illumination which surrounded the Governor in this great compliment also reflected some of its rays upon them, the Company, and its officers over whom the Governor so ably presided.

Reply by the Governor.

The Governor: If no questions are asked, I have really no observations to make upon the speeches that have been made, except to thank very cordially all those who have spoken for the very friendly and encouraging words they have used with reference to the Company as it stands to-day. To me, it is always a great pleasure to listen to Mr. Hounsom speaking at these meetings, because, if I may say so, he manages to express in admirably appropriate language the sentiments which, in my halting tongue, I should very much like to express myself. I always find myself completely in harmony with his views. With regard to the observations by Mr. Kimber, which I hope I did not shorten—it was certainly not my intention—it must be borne in mind that, while the use of oil for gas making is of enormous advantage to us and all gas companies who use it, we are not in a position to transfer the manufacture from coal to oil, because, at the present time, except under peculiar circumstances, we are not able to make the same quantity of gas from oil at the same cost as from coal. At the same time, the use of oil has helped us to manufacture gas from coal very much more cheaply than if we had not had it as an adjunct. I hope Mr. King does not think that, in commemorating the Centenary year, we have been forgetful or negligent with regard to those who have passed away, and who did so much towards building up this Company and the gas industry. They have been very much in my mind during this period; and if I did not refer to them to-day, it was because I expressed the hope that the pamphlet had done the justice that Mr. King desires should be done to those who have gone from among us. For Mr. Jones's poetic retrospect of the growth of the Company and its influence upon the well-being of mankind, we all thank him.

The resolution was then put to the meeting and carried unanimously.

The Dividend.

The Governor: The Secretary will read the next resolution.

The Secretary then read the Directors' minute of July 18 as to dividend.

(1) That the sum of £15,000 be set aside out of the divisible profits of the Company for the half year ending the 30th day of June last towards the redemption fund, in accordance with the provisions of the Company's Act of 1903, and

(2) That a dividend as follows for such half year be declared—viz.:

On the 4 per cent. consolidated preference stock, at the rate of £4 per cent. per annum.

On the 3½ per cent. maximum stock, at the rate of £3 10s. per cent. per annum.

On the ordinary stock, at the rate of £4 17s. 4d. per cent. per annum.

Subject to deduction of income-tax.

The Governor: I beg to move this resolution, and, in doing so, I can say, without any reservation at all, that the increased dividend which we are proposing to-day we feel to be as assured as any of those we have proposed in the past.

The resolution was put, and carried unanimously.

The Governor: Ladies and gentlemen, that concludes the business of the day; and I thank you for your attendance.

Votes of Thanks.

Mr. King said he felt very much flattered by being asked to move: "That our best thanks be given to the Governor and Directors for their conduct of the business of this Company and to the Governor for his conduct in the chair." It was a source of very great pleasure to him to propose this resolution, because they were almost like old friends from boyhood, and it was a great pleasure to see the Governor occupying his accustomed seat. It was due to the Governor in a large measure that the prosperity of the Company had arisen; but, however much the Governor desired to sacrifice himself for the Company, it would be impossible for him to accomplish the work unless he had valuable and able colleagues. In the resolution he would include the whole of the officers and staff and the workmen who had so faithfully carried on the business of the Company.

Mr. W. C. Wheatley seconded; and the resolution was put and carried unanimously.

The Governor: On behalf of my colleagues, I thank you very much indeed for this resolution. I should like Mr. Watson to respond for the officers; but as the staff has been included in the vote, I should like to say how complete is the satisfaction of the Board with all the members of the staff. I should like to give, as an illustration, that really remarkable gathering which took place three weeks ago at the Crystal Palace. That was, I believe, on the greatest authority—Messrs. Lyons tell me it was so—the largest thing of the kind ever attempted; and, so far as any of us could see, there was not the slightest hitch at all in carrying through the arrangements. This was almost entirely due to Mr. Watson and the staff generally, and their admirable organization. I am glad the workers are included in the vote, because there again the cheerful, happy, contented, and helpful way in which these men meet one now and carry on their important share in the conduct of this undertaking is one of the joys of my life. I have never known a body of men both look and act so heartily in accord with the circumstances and the prosperity of the Company as our men do at the present time.

Mr. D. Milne Watson (the General Manager): Mr. Woodall, Mr. King, Ladies and Gentlemen, I thank you very much indeed for the very kind words you have spoken as to the work done by the officers, the staff, and the workmen. The work done during the past half year has, of course, been rather strenuous, owing to matters beyond our control, such as the coal strike and so on; but we are all rewarded by thinking we have earned success and your appreciation of the way in which the work has been carried out. We owe a deep debt of gratitude to the Board for the handsome way in which they have treated us over the Centenary, which has given all the officers and men a very happy time; and our reward is to feel that we have made a success. In return, we can say that we are a happy and a united band of officers and workmen.

SOUTH SUBURBAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of the Company was held on Friday last, at De Keyser's Royal Hotel, Victoria Embankment, E.C.—Mr. Charles Hunt in the chair.

The Acting Secretary (Mr. H. A. Floate) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

The Coal Strike.

The Chairman: I now beg leave to move the adoption of the report and accounts, and in doing so it becomes my duty to offer a few observations relevant to the period to which they relate, which has been more than usually eventful. In the first place, we have had the altogether unique experience of a general coal strike, by which, as you know, all the collieries in the United Kingdom were, with but one or two exceptions, shut down, and remained so for about six weeks, during which time no coal was raised; nor until some weeks after work was resumed did our supplies begin to come forward—only to be again interrupted by the London dock strike. So that for the space of nine weeks scarcely a ton of coal was received by the Company, while for at least an equal period the deliveries were much less than the contract quantities. But, as will have been gathered from the report, there was never the least necessity for curtailing the supply of gas to consumers, and at no time was there less than a fairly good stock of coal. The only mark left on our accounts by this great strike is the recorded production of a small proportion of carburetted water gas. Proprietors are doubtless aware that as a rule carburetted water gas is not made by this Company, although we are well equipped with plant for the purpose. We have found it to be more economical to make all coal gas, which, in addition, secures to consumers uniformity of quality. The value, however, of carburetted water gas as a stand-by or occasional substitute for coal gas is fully appreciated, and to a very moderate extent advantage was taken of it during the strike, to eke out the stock of coal—the proportion used being such as might have been largely exceeded without inconvenience had the necessity arisen. It will therefore be realized that the end of the strike did not find us by any means at the end of our resources, in which respect our experience was practically that of the vast majority of the gas undertakings affected. The fact that extremely few cases of short supply of gas resulted from the total cessation of coal supplies for so long a period is an experience which, even if it stood alone, is proof enough that, as has been remarked by a labour leader, the community has a great reserve of resisting power. This reserve will hardly be allowed to grow less in face of the standing menace of the new combinations of trade unions. It is lamentable that a general strike, with all the suffering and hardship it brings in its train, should have been resorted

to for enforcing demands, the crudeness of which seems apparent from the recent awards under the Minimum Wages Act. Nor can it be contended that the gain from it to the miners was greater than might have been secured by friendly conference in the several districts affected. Moreover, the temporary stoppage of supplies has benefited the coal-owners out of all proportion to the advantage reaped by the miners, since it enabled them to raise the price of coal abnormally, to the great detriment of the industries of the country.

THE AMALGAMATION BILL.

The other event to which I desire specially to refer is the passing through Parliament of our Bill for the acquisition of the Bromley and Crays and the West Kent undertakings. The Act now contains several additional provisions, perhaps the most important of which are those for the gradual abolition of differential charges for gas. As originally framed, the Bill provided for a permanent differential charge of 7d. per 1000 cubic feet in the adjoining Bromley and Crays and West Kent areas; but this charge will now eventually disappear—in Bromley and Crays by successive reductions of 1d. per annum, commencing in July, 1919, and in West Kent by similar successive reductions commencing in July, 1925. So that in twenty years time from now there will be uniformity of charge throughout the united area.

THE CALORIFIC STANDARD.

The next alteration referred to in the report is the substitution of a calorific value test for the existing test for illuminating power. On this question being raised by the London County Council, the Directors decided that they could not oppose such change if desired by the local authorities affected, and provided the interests of the Company were adequately safeguarded. After very friendly discussion, a clause was agreed to, which, while not conceding all that we felt entitled to ask for, is, in our opinion, a sufficiently workable clause, and has the merit of recognizing the British thermal unit as the basis of measurement instead of the Continental standard adopted in previous calorific value tests. One or two local authorities prefer to remain as they are, with the test for illuminating power. To this, there is not the slightest objection—it being a matter of indifference whether our gas be tested for illuminating power or for calorific value, so long as penalties are not enforceable by any one authority in respect of both tests.

THE OBJECTIONABLE CHEMICAL CLAUSE—A PARLIAMENTARY INQUIRY GRANTED.

If my observations on the Bill could have ended here, I should have been relieved of a somewhat unpleasant duty; but it is necessary for me to refer to a clause which has been put upon us and other gas undertakings this session at the instance of the Alkali Manufacturers' Association. This clause is quoted in the report, and its effect is to limit the competition for gas-works residuals in favour of the Alkali Manufacturers' Association. We feel this limitation to be not only contrary to the liberty of trading, but also diametrically opposed to the public interest—experience having fully proved the advantage of allowing gas undertakings to work up gas residuals other than their own. Take, for example, spent oxide of iron. As you know, this derives its value from the sulphur it contains, which represents the sulphuretted hydrogen removed from the gas in the process of purification. This sulphur is used for making sulphuric acid, which, in its turn, is required for the manufacture of sulphate of ammonia from gas liquor. The time may come when we shall want to do as other gas undertakings are doing—namely, to make our own acid, in which case it would greatly hamper us to be restricted to the use of the spent oxide we produce, because the manufacture of sulphuric acid, in order to be profitable, has to be conducted upon a fairly large scale. In the meantime, this Company derives considerable benefit by purchasing sulphuric acid from a neighbouring gas undertaking, on terms lower than those offered by members of the Alkali Manufacturers' Association; and if this objectionable clause became at all general, it might very possibly result in our being cut off altogether from this our cheapest market. Take, again, an even stronger case—that of gas liquor, from which sulphate of ammonia and other ammonia products are made. It is only in works that have attained a certain size that sulphate plant can be successfully employed; and there are numerous smaller works throughout the country from most of which the gas liquor is now run to waste—they being at too great a distance from any alkali manufacturer to justify the cost of carriage, and there being no other market for it. Some, however, of these small works are within reach of larger works possessing sulphate plants, and in such case it has long been the practice (I venture to say, quite a natural one under the circumstances) for the larger undertakings to purchase gas liquor from the smaller ones, to work up with their own. The two classes of undertakings are in this way mutually helpful—the smaller undertaking making a profit out of the gas liquor which they could not otherwise have obtained, and the larger ones increasing the profit already being made. Parliament, however, by implication, contemns this practice; for by the imposition of the clause complained of it is doing all that is possible to prevent its extension. It is not, of course, to be denied that here and there a more than usually enterprising gas undertaking may compete for gas liquor with a member of the Alkali Manufacturers' Association. But if so, the public are the gainers; while the plea that competition between gas undertakings privileged by statutory authority and able on that account to raise money on lower terms than (say) Brunner, Mond, and Co., who are paying regularly something like 30 or 35 per cent. on a capital said to be largely created out of revenue, seems puerile in the extreme. Clearly statutory undertakers ought not to become manufacturers of all kinds of chemical products, beyond what may be derived from gas manufacture; nor do they wish to. What they do want is a continuation of the liberty they have hitherto enjoyed of helping one another in this disposal of gas residuals. This liberty is being taken away from the gas industry without, as is conceived, their full case having been heard. Proprietors will, of course, understand that this clause is not taking away from the Company anything that has been of value to it in the past; our concern being with regard to the future. I am glad also to be able to say that Parliament has recently taken a less uncompromising attitude with regard to the clause, and that, upon representations made to it on behalf of the gas industry, a parliamentary inquiry into the matter is to take place probably early next year. It is to be hoped that this will result in a satisfactory settlement.

GOOD WORKING AND A REDUCTION IN PRICE.

Turning now to the accounts, these show that the trading for the half year has been successful. The gas sales do not, it is true, exhibit the same increase as last year, when it was over 5 per cent.; but it is something to have not only maintained the position then gained, but to have improved upon it. As is well known, this Company is much less fortunate as regards increases than some of its neighbours, owing to the district being pretty well filled up. There is a falling off in the gas-rental consequent upon the reduction of 1d. per 1000 cubic feet made last year—this not having been made up by the increase in the sales of 1·64 per cent. All other receipts, however—particularly those from residuals—show increases; but according to past experience, the present high values of these are not destined to remain permanent, though there is no reason to apprehend any immediate falling off. We have also been greatly helped during the last two years by a substantial improvement in the carbonizing results, which is highly creditable to all concerned. In particular, the production of sulphate of ammonia has steadily improved until it has now reached the very respectable figure of 27 lbs. per ton of coal carbonized, and there has also been an increase in the yield of tar for the half year. The efforts, however, of an undertaking such as this by no means end with the production of a cheap gas; for it is at least as important to know how to sell it. We are always on the look-out to strengthen as far as practicable the sales department of the Company; and the coming fusion of the three undertakings will necessitate arrangements for extending the efficiency of this department, which are engaging the attention of the Directors and their advisers. As indicated in the report, the coal strike did this Company no further harm than to cause a depletion of the stock of coal; the cost for the latter being less than for the corresponding half of last year. Other items of expenditure are also less. The net result, after strengthening the officers' superannuation fund, in anticipation of further liabilities consequent upon the coming amalgamation, and discharging certain liabilities to capital account for plant and buildings abandoned, is a credit balance on revenue account of £29,334; the balance applicable for dividend being £42,886 in all. Deducting from this the dividends recommended and the debenture interest, the amount to be carried forward to next half year is £23,740, or about £7000 more than was carried forward last half year. This increased balance forward enables the Directors to carry out their intention, announced some time ago, of making a further reduction of 1d. in the price of gas—to 2s. 3d. per 1000 cubic feet—the lowest price yet reached by this Company, and which, provided the profit be sufficient, will entitle proprietors to a dividend of 6 per cent.; the bonus to co-partners being at the same time increased from the present 7 to 7½ per cent. The immediate future is, however, one of anxiety as to coal prices, any substantial rise of which could not but be viewed with serious apprehension. This, I may perhaps remind you, is the last meeting of the Company under existing conditions. Henceforth the general meetings will be those of the enlarged Company, though without change either of name or of management. We all hope, I am quite sure, and believe also, that the alliance which is so shortly to be concluded will be to the lasting benefit of all the interests concerned.

THE NATIONAL INSURANCE ACT.

The last paragraph in the report indicates that a satisfactory way out of the perplexities of the National Insurance Act has been found. The Directors are very pleased to know that the proposals they were able to make have been fully appreciated by the employees and unanimously accepted by them. Draft rules for an "approved society," which will embrace practically the whole of the employees of all three Companies, have been submitted for the approval of the Insurance Commissioners; and the benefits under them will exceed those which are receivable under the Company's existing sick fund.

THE REPORT ADOPTED—QUESTION OF DIRECTORS' FEES.

Mr. CHARLES CARPENTER, in seconding the motion for the adoption of the report, remarked that Mr. Hunt had made such an admirable and lucid speech that there was very little left for him to add. There were, however, one or two points that he would like to emphasize; and he would first of all take the most important one—that of the cost of gas manufacture. This figure, which now stood at £61,000, was something like £10,000 lower than it was for the corresponding half of last year. This reflected the greatest possible credit upon the management of the undertaking, because it implied that almost the very highest possible carbonizing results were obtained from the coal bought. Then, he thought, very great credit was due (and in this case it was particularly due) to the Chairman and to the Engineer of the Company for their foresight with regard to coal stocks. It was quite true, as Mr. Hunt had pointed out, that many other undertakings had got through the great time of trial which was brought about by the national coal strike; but he thought very few of them could say that they had come through with such flying colours as the South Suburban Company had. He said this with a knowledge of what had happened in the case of other companies, and an intimate knowledge of what had happened in the case of the South Suburban undertaking. Mr. Hunt had touched lightly upon the question of forming an approved society; and there, again, he (Mr. Carpenter) thought that they might congratulate themselves upon the very admirable manifestation of loyalty on the part of the workmen, as evinced by the unanimous manner in which they desired the Company, under the altered conditions brought about by the National Insurance Act to still go on with the sick fund which had been in operation, and which had been so useful, for so many years past. There was one other matter on which he wished to say a word. This referred to Mr. Hunt's statement that the present gathering would be the last meeting of the South Suburban Company as, he might say, originally constituted. The Chairman had reminded them of the big changes that had been brought about in the last half year by these amalgamations, which the Board had every hope, and every belief, would be of great benefit to the Company, the shareholders, and the consumers. But he (Mr. Carpenter) would like to take the opportunity of saying what Mr. Hunt could not say for himself, and what no one

on the shareholders' side of the table could say, because they were not so familiar with the circumstances as the Directors. He wished to say how very much the Company were indebted to Mr. Hunt for the admirable manner in which he had carried out difficult and delicate negotiations with regard to the amalgamations, and the extremely able way in which he had, in the Act which now only awaited the Royal Assent, brought them to a conclusion. The Company, he considered, owed a great debt to Mr. Hunt in this matter, which the shareholders could not realize, and which he asked them to accept from him as being very palpable and existent. [Applause.]

Mr. HAROLD GUNDRY said this was a most important meeting, because they were about to blossom out into a much larger concern. But he was sure that all who had noted the way in which the Company had been managed in the past felt the utmost confidence in the Chairman and Directors with regard to the carrying on of the business in the future. One point which struck him was that, with the absorption of these three undertakings, a very large amount of additional work would be thrown on the Board of the Company. He fancied there were about twenty Directors of the old Companies that had been absorbed; and all their work would now fall upon the South Suburban Board. Under these circumstances, he did not think it would be fair of the shareholders to expect the Directors to perform all this extra work without a certain amount of additional remuneration. The proprietors could not look back on the past without experiencing a feeling of gratitude to the Board for all that they had done for them; and he might say that personally he did not believe there was any better managed company in the kingdom than the one to which they belonged. As they knew, gas companies had passed through stormy times; yet their own undertaking had been working perfectly smoothly. All this pointed to good management. The Board, and especially the Chairman, were always on the alert to carry out improvements for the good of the Company. He believed that they had not drawn the full amount of fees that was voted to them by the shareholders; and to his mind this was an excellent opportunity for the shareholders to make some recognition by voting the Board some increased remuneration for their additional labours. Therefore, if in order, he would like to move that an additional adequate sum be placed at the disposal of the Directors for extra remuneration.

The CHAIRMAN pointed out that notice of intention to move such a resolution must be given. Mr. Gundry could, however, deal now with the amount the Board were already authorized to take. They had been one Director short, and his fees had not been paid. To increase the amount of £2500 already voted by the proprietors, notice might be given of a motion for the next half-yearly meeting.

Mr. GUNDRY replied that he would now give such notice for the next meeting; and for the present he would propose that whatever sum had not been used which had been voted by the shareholders should be added to the fees of the Board. He asked how much had not been appropriated.

The CHAIRMAN: Between £600 and £700 altogether for the year.

Mr. HUGH WYATT seconded the proposition.

Before it was put to the meeting, the report and accounts were unanimously adopted; and then Mr. Gundry's motion was cordially agreed to.

The CHAIRMAN said he could only express, on behalf of himself and his colleagues, their great appreciation of the action of the shareholders, which he might say, so far as he was concerned, and he believed his colleagues also, was quite unexpected. It was true that a large amount of additional work had devolved upon the Board, and would devolve upon them in the future; and therefore it seemed only equitable that they should have some little share at all events in the big saving which the united undertaking would effect in consequence of the amalgamation. The amount of fees they would be abolishing would be nearly £2000 a year.

THE DIVIDEND.

The DEPUTY-CHAIRMAN (Mr. Jabez Light) proposed that a dividend for the half year be declared at the rates per annum of 5 per cent. on the preference stock and 5⅞ per cent. on the ordinary stock, less income-tax. He felt sure all would agree that, in the face of all their difficulties (and they had, as the Chairman had explained, been very great), the result of the half-year's working was highly satisfactory.

Mr. W. G. WALLER seconded the resolution, which was agreed to.

VOTES OF THANKS.

Mr. CHARLES BEADLE remarked that the Directors had had a lot of work to do, and they had done it very well. They had improved the prospects of the Company, and there was every reason to believe that it would continue to be one of the most successful of gas undertakings. He proposed a hearty vote of thanks to the Chairman and Directors.

Mr. E. W. DREW seconded the motion, which was heartily passed.

The CHAIRMAN, in returning thanks, said it was hardly necessary for him to tell the shareholders that they were a united Board, and that every step that had been taken in connection with this important amalgamation had been with the concurrence of the whole of the Directors. It was therefore not surprising that their efforts had been successful. He would like now to move a cordial vote of thanks to the staff and employees for their services during the last half year. Any efforts he or the other members of the Board might make would be powerless without the hearty co-operation of officers and men. Mr. Shoubridge, their Engineer, they had with them, and also Mr. Floate, their Accountant, who had been acting as Secretary in place of Mr. C. M. Ohren, who had resigned after serving the Company for a great many years. The Directors had been engaged in appointing a new Secretary in Mr. Ohren's place, and, after very careful consideration, they had unanimously selected a gentleman who they believed would worthily uphold the traditions of the South Suburban Company. This was Mr. Wilfrid Wastell, who was now Deputy-Secretary to the Birmingham Corporation Gas Department.

The motion was seconded by Mr. GUNDRY, and unanimously carried.

Mr. SHOUBRIDGE, in responding for himself and the engineering staff and employees, said they realized that they were now at the commencement of a new epoch in the history of the Company—an era which was to be one of extended usefulness, larger opportunities, and greater responsibilities; and they were all determined to strive their utmost to make the enlarged undertaking as successful as the old one had been, and had the utmost confidence that they would do so.

Mr. FLOATE returned thanks on behalf of the secretarial department.

BRENTFORD GAS COMPANY.

Directorial Changes—A Large Increase of Business and the Cost of the Coal Strike.

The Half-Yearly Meeting of the Company was held last Friday, at St. Ermin's Hotel, Caxton Street, Westminster—Mr. ULICK J. BURKE in the chair.

The SECRETARY (Mr. William Mann) read the notice convening the meeting; and the Directors' report and accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said, in the first place, he need hardly tell the proprietors that there was a vacancy on the Board. They had no doubt all heard of the very sad loss the Board had incurred by the death of their colleague, Mr. H. H. Batten. It was a loss they all felt very deeply, because Mr. Batten was an admirable Director, wise in counsel, and always ready to carry out his administrative duties. The Directors had considered the question of filling the vacancy, and had decided to invite Mr. Griffith to occupy the post. The proprietors knew him. He had been Solicitor of the Company since 1894, and was therefore thoroughly familiar with everything connected with the concern; and he (the Chairman) was quite sure that Mr. Griffith would make an admirable Director. He would vacate his office as Solicitor of the Company; and that was a matter the Board would have to discuss. Turning to the accounts, the proprietors would perhaps have noticed that, although the net result was eminently satisfactory, there were some apparently adverse items that called for comment and explanation. It would be observed, for instance, that coals and oil had cost more by £3874 than in the corresponding half year of 1911. The proprietors would no doubt have anticipated there would be a rise in costs by reason of the strike; but the increase was more than accounted for by the additional business done—in fact, an increase of 7·59 per cent. on the volume of gas sold had been met by an increase of only 4·32 per cent. in the expenditure on raw material, and the cost of raw material per 1000 cubic feet of gas sold showed a saving of 0·45d. as compared with the corresponding period of 1911. In view of the increased cost of handling and difficulties in obtaining supplies during the past half year, owing to strikes and other causes, they would agree the item might be considered a very satisfactory one. Then purification was higher to the extent of £557, due partly to the increased volume of gas produced, partly to increased make per ton, and partly to structural alterations carried out at Brentford during the half year, and which had now been completed, and therefore a saving might be anticipated. With regard to distribution, the amount against salaries and wages showed an increase of £1642—an increase partly accounted for by the growth of business, but mainly attributable to the exceptional demand for gas apparatus—fittings, stoves, and everything had been in very big demand during the half year. Public lamps showed an abnormal increase amounting to £1834; and this was owing to the Company having entered into long-period contracts with a number of local authorities. Under these contracts the street lighting was being modernized, and a temporary increase under this heading was therefore inevitable. Then it would be observed that the Company had taken less for ammoniacal liquor by as much as £1274. The production under this head had been reduced by the substitution to a large extent of oil for coal in manufacture during the strike. They had to economize coal as much as possible; and therefore they did not get ammoniacal liquor in the same way. The only other noticeable increase to which he would call attention was the cost of meter repairs and renewals, and in that of stoves—amounting in the one case to £4951, and in the other to £1799. These extra expenditures were due to quite exceptional considerations—to the increased demand partly both for cooking and heating and also to the fact that reductions in the price of gas had entailed considerable work and expense in the adaptation of slot-meters to the altered price. These were the salient points in the accounts which called for criticism. On the other hand, the proprietors would be glad to observe a substantial increase in the receipts from the sale of gas and residuals, amounting to £4711 in the case of gas, to £1403 in that of coke, and to £3793 in that of tar. The sum of the accounts presented them with a balance, after allowing for all fixed charges, of £54,298, out of which the Directors recommended the declaration of dividends as in the report, which the proprietors would no doubt have observed included an increase of ½ per cent. There was not much else to tell respecting the history of the Company during the half year, except, of course, the proprietors would appreciate that the Board and officers had had an anxious time during the coal strike. Many of the proprietors would probably have wondered how the Brentford Company had managed during the withdrawal of the coal supplies. What they did was to take time by the forelock. The Board foresaw that a strike must come; and they prepared accordingly. When the strike did come, when practically war was declared, it found the Brentford Company with its yards stocked with material as though for a siege, and prepared to weather quite as long time as it was anticipated the strike would last. *Plus* this, the consumers were, of course, very anxious—not only the Company's consumers, but all the people in the district were in a great state of anxiety to know where they were to get the means of heating. What the Company told their consumers was: "We cannot give you coal, but we can give you gas." And the consumers did have gas; and they had it without a halfpenny increase in the price. So the usual consumers of coal were able to have their gas-fires going just in the same way as they had done their coal-fires. Whether the Company got any gratitude for this was doubtful; but that was not very important. They were told that "Gratitude consists in a lively sense of favours to come;" and he thought that the gratitude of their consumers would take the form of a considerable patronage of gas in future, both for cooking and heating. However, the coal strike was

over, and so was the dock strike—at all events, for a time. But he need hardly say the state of the labour world must be, for a long while, a matter of great anxiety to the Directors; and therefore it would be necessary for them to keep an eye to a certain extent on the Company's cash-box, because coal was going up in price, but so would coke. With regard to coal and oil, it was very gratifying to know that the Company had coal and oil contracts that would carry them through another year; and, therefore, to a large extent, they would have freedom from the increase in the price of coal and oil, and at the same time take a large sum for coke. Nothing in a public way occupied the attention of the Company at the present time, except that there had been several important conferences with regard to income-tax and the allowance for depreciation of works. The principle had now been established, and recognized by the authorities, of allowing depreciation on certain plant and machinery. There was one matter of a personal nature to which he should like to refer. The hope was expressed on the occasion of their last meeting that the salary of the Secretary might be increased. An increase was not in the province of the Board. But perhaps the proprietors would like a little guidance from the Directors. Mr. Mann had been in the Company's service 45 years. They were 45 years of good service; and the Board would be very glad indeed if it were moved from the other side of the table that an increase in salary be given to their Secretary. If he might be allowed to make a suggestion, it was that an addition be made to Mr. Mann's salary of £50 in each of three years, commencing from Jan. 1 last. This would bring his salary up to £1200 per annum; and the Directors did not think, looking at their Secretary's services to the Company, it would be a bit too much.

Mr. Reginald J. N. Neville, M.P., seconded the motion, remarking that this was as favourable a report as the proprietors had ever had. Considering the difficulties they had had to meet, he thought that it was due to the good organization generally on the part of their Engineer and Manager (Mr. Alex. A. Johnston) and those under him that they had not a single bit of trouble with any of their men. The men had worked splendidly. It was a good thing for companies to be on the best terms with their men who helped them to make the profits. The policy of the Company ever since he had been connected with it (now for nearly twenty years) had been on a most conservative basis. The capital had been spent with almost critical care; and, when any had been expended, it had been with the view of saving revenue expenditure or bringing in more revenue. They would benefit from this policy in the future. As to the extra ½ per cent. dividend, the Board would not have advised it had they not felt there was every possibility, every probability, and almost a surety, that the increase would be maintained.

The Chairman said he was glad Mr. Neville had rectified an oversight on his part by calling attention to the zeal that had been shown by Mr. Johnston and his staff during the strike, as well as the absolute staunch loyalty of the men. He should like it to go out to the men that the proprietors did appreciate the way they had worked.

Replying to questions by Mr. William Morris, the Chairman stated that the Company's stock of coal was again at normal level. As to the men, the Directors had not adopted a co-partnership system; but they had arranged a pension scheme, which was very acceptable to the men.

The motion was unanimously carried.

Moved by the Chairman, and seconded by Mr. Neville, a dividend at the rate of 5 per cent. per annum was declared on the 5 per cent. preference stock, at the rate of 13½ per cent. per annum on the consolidated stock, and at the rate of 10½ per cent. per annum on the new (1881) stock, subject to income-tax.

Moved by Mr. Richmond, and seconded by Mr. Osborne, the increase in Mr. Mann's salary, as suggested towards the close of the Chairman's address, was cordially agreed to.

On the proposition of Mr. W. Richards, seconded by Mr. Osborne, a hearty vote of thanks was passed to the Chairman and Directors, to the Engineer (Mr. Johnston), the Secretary (Mr. Mann), their staffs, and the workmen.

The Chairman expressed appreciation on behalf of all; and the proceedings then concluded.

GLASGOW CORPORATION GAS UNDERTAKING.

The Past Year's Working.

The annual report of the Gas Committee of the Glasgow Corporation has been issued, and it shows that on the working in the year ended the 31st of May there was a surplus of £27,503. The market for residuals was favourable; and the consequent increase of income from this source amounted to £26,676. The average price received per ton of coal carbonized was 5s. 2·526d., compared with 4s. 6·129d. for the previous year—an increase of 8·397d. per ton. The quantity of coal carbonized was 687,542 tons, against 675,580 tons before—being an increase of 11,962 tons. The net sum realized from the sale of coke amounted to £118,710, or £14,131 more than that for the year 1910-11. The total quantity of coke sold was 298,729 tons, as compared with 289,476 tons, or 9253 tons more. The average price received was 8s. 7·8d. per ton, against 7s. 10·129d.—an advance of 9·671d.

The quantity of gas made per ton of coal carbonized was 10,483 cubic feet, compared with 10,437 cubic feet in 1910-11; being an increase of 46 cubic feet per ton, or a total of 31,626,932 cubic feet. The extra gas sold amounted to 120,986,234 cubic feet. The unaccounted-for gas was 9·024 per cent., compared with 8·721 per cent. before. The greatest quantity of gas sent out in 24 hours was 35,290,000 cubic feet; the maximum daily make being 31,016,000 cubic feet.

During the year there was a net increase of 3860 meters. The number of ordinary meters in use on the 31st of May was 217,523, as compared with 221,613 meters in the preceding year, or a decrease of 4090; the number of prepayment meters being 65,018, compared with 57,068, or an increase of 7950. During the year 34,651 meters were repaired.

As from the 1st of March last, gas-cookers, range-fittings, and grills have been supplied on loan to domestic consumers free of hire. The Committee point out that this will mean a direct loss of about £10,000 per annum; but it is anticipated that the increased revenue obtained from the sale of gas will compensate for it. The number of cookers and grillers on loan on the 31st of May was 100,693, compared with 78,997 for the preceding year—an increase of 21,696. Gas-heating appliances are now let out on simple hire; and it is expected that there will be a large demand for them during next winter. The number of heating and cooking appliances sold during the year was 3962; and, in addition, 2784 gas-fires were supplied on the hire-purchase system, compared with 1815 for the preceding year. There was a decrease of 52 in the number of gas-engines in use last year, but an increase of 92¾ in the total brake-horse power. About 11¼ miles of new mains were laid during the year, which brought the total up to 1039 miles.

EDINBURGH AND LEITH GAS COMMISSIONERS.

A Meeting of the Edinburgh and Leith Corporations' Gas Commissioners was held in Edinburgh on Monday of last week—Bailie Inches presiding.

Unemployment Insurance—Exemption Refused.

The following letter from the Board of Trade Central Office for the Labour Exchanges and Unemployed Insurance, in reply to the Commissioners' request that their employees be exempted from the unemployment section of the National Insurance Act, was read:—

> Sir,—I beg to inform you that the application made by the Edinburgh and Leith Corporations' Gas Commissioners for the exemption under section 107 (4) of certain classes of their employees from the provisions of Part II. of the National Insurance Act (Unemployment Insurance) has been carefully considered. It appears from the details included in the application in question that the employees concerned are liable to dismissal for other causes than misconduct, neglect, or unfitness to perform their duties, and without the necessity of referring to the Commissioners. Subject, therefore, to any further information which you may desire to lay before them on this point, the Board of Trade are not satisfied that the workpeople in question are in as permanent a position as that of persons serving in an established capacity in the permanent service of the Crown. In these circumstances, they regret that they are unable, as at present advised, to accede to the application.

The Chairman said the letter meant that the Commissioners would have to pay 2½d. for each man, and the man himself would have to pay 2½d. About 100 men were affected.

Bailie Lindsay said the men were particularly anxious that application should be made for exemption. He did not think they should take a final resolution in the matter that day, but should remit it to the Committee for further consideration. It meant a great drain on the men, who were not only paying under the Insurance Act, but making a weekly payment for superannuation.

After some further discussion, it was agreed to remit the matter back for consideration in Committee.

Traders' Terms for Fixing Gas-Fires, &c.

The following is the agreed scale of rates for the fixing of gas fires and radiators by traders; the diameter of pipe being ½-inch and ⅝-inch: For connecting-up with 5 feet run of piping, including all connections, 4s. 9d. per fire or radiator; 6 feet to 10 feet run, 5s. 9d.; 11 feet to 15 feet run, 6s.; 16 feet to 20 feet run, 6s. 6d.; 21 feet to 30 feet run, 7s. 6d.; 31 feet to 40 feet run, 8s. 6d.; 41 feet to 50 feet run, 9s. 6d.; 51 feet to 60 feet run, 10s. 6d.

ACCRINGTON DISTRICT GAS AND WATER BOARD.

The Past Year's Working.

The General Manager of the Accrington District Gas and Water Board (Mr. Charles Harrison) has presented his sixteenth annual report, embracing the twelve months ended the 31st of March last. He states that the railway and coal strikes caused a rapid depletion of the available stocks of coal, and great difficulty was experienced in obtaining deliveries when purchases had been made at famine prices. However, by the exercise of great care and determination, the Board were enabled to pass through the crisis with a minimum of inconvenience to the gas consumers. The quantity of coal carbonized during the year was 39,014 tons; and the gas accounted for was 398,167,387 cubic feet, of which 392,770,300 cubic feet were sold. The gross profit made on the two undertakings was: Gas, £22,200; water, £20,666—together, £42,866. Of the first-named sum, £12,053 was paid in annuities and interest on mortgage and debenture stock, £5016 was added to the sinking funds, £1755 was devoted to a new sulphate-house and plant, and payments on water account and for income-tax and bank interest made up a total of £19,551; leaving a balance of £2649. The surplus revenue of the Gas Department is now £11,647. The number of gas consumers is 20,179—an increase of 396; and of prepayment meters in use 8618, or 874 more than in the year 1910-11. There are 5918 cookers, 1609 gas-fires, and 841 boilers in operation—an increase of 486 for the year.

With regard to the Water Department, the quantity of water sent into the district during the year was 822,146,000 gallons, or 26 gallons per head per day for all purposes. The revenue from the supply of water amounted to £29,089, or £2990 more than for 1910-11. The gross profit was £20,665—an increase of £2614. After payment of annuities, interest, sinking fund, and instalments of loans, &c., there is a net loss of £54, which, under the powers contained in the Board's Act of 1905, has been transferred and charged to the revenue account of the gas undertaking; making with the previous charges a total sum of £50,048 borne by the undertaking on account of the deficiency on the water-works. Mr. Harrison explains, however, that there is really no deficiency, as the £54 represents a portion of a capital sum which has been charged against the revenue account.

WORK AND POSITION OF THE METROPOLITAN WATER BOARD.

Statistics for the Past Year.

At the last Meeting of the Metropolitan Water Board, a draft report on the work for the twelve months ended the 31st of March was submitted. It furnished the following particulars.

The funded debt of the Board at the above-named date was £48,664,558, and the interest payable thereon £1,460,312. In addition, the Board are liable for annuities and rent charges to the extent of £1,468,212; while £1,000,000 of money bills remain outstanding. The Finance Act, 1910, seriously reduced the rateable value of licensed premises; and the Board sustained an approximate income loss of £17,000 per annum from this class of property. Moreover, the recent quinquennial revaluation of the Metropolis disclosed a great shrinkage in the rate of increase over the previous period. The highest rate of increase was 18·89 per cent. in 1881, and the lowest had been 7·45 per cent. in 1891. In 1911, however, the rate sank to the phenomenal figure of 3 per cent. The recent valuation also showed for the first time an actual decrease in value as compared with the preceding year; representing a further loss of income of £8000 per annum. The percentage of the total amount collected in the half year to March 31, in respect of domestic supplies and fixed charges, was 91·81, compared with 90·02 for the corresponding period of last year and 89·97 for the period to Sept. 30, 1911.

The sources of London's water supply are four—viz., the Thames and Lea, the gravel beds adjoining the main stream of the Thames and other beds at Hanworth, natural springs, and wells sunk in the chalk in the Lea Valley on the north of the Thames, in Kent, and at certain other points south of the river. The Thames furnished 59·8 per cent. of the total supply, compared with 58·6 per cent. in 1910-11. The daily average quantity of water gauged at Teddington was 1519·4 million gallons—an increase of 81·9 million gallons compared with 1910-11. The daily average total abstraction from the river was 153·6 million gallons. The daily average natural flow at Teddington was therefore 1673 million gallons during the year, compared with 1574·4 million gallons in the preceding twelve months. The total volume abstracted from the river was 56,215·6 million gallons, or 6252·8 million gallons more than 1910-11.

The total quantity of water supplied during the year was 89,437·2 million gallons—being a daily average of 244·4 gallons. The month of maximum average daily supply was July, and the minimum month April. The difference between the two was 65·66 million gallons. The total number of services at the end of the year was 1,106,996—an increase of 9182 over the preceding year. The percentage of supplies on the constant system was 99·22, compared with 99·23 before. The increase in the number of services on the constant system during the year was 9074, or 83 per cent.

The effective amount of reservoir storage capacity for unfiltered water possessed and in use by the Board at the end of the year was: In the Thames Valley, 7267·5 million gallons; in the Lea Valley, 2499·2 million gallons—total, 9766·7 million gallons. The storage in existence, in course of construction, and authorized but not begun, is 25,066·7 million gallons.

The following table shows the increases which have taken place under the Board in the active equipment of water-works since the transfer of the undertakings:—

	Before June, 1904.		At March 31, 1912.
Storage reservoirs for unfiltered water.	57	..	48
Acreage	873	..	1,557
Capacity in million gallons	4,077·6	..	9,766·7
Service reservoirs for filtered water	75	..	85
Capacity in million gallons	244·5	..	314·3
Filter beds	137	..	171
Acreage	139	..	169·4
Engines	235	..	270
Horse-power	32,177	..	41,195
Miles of water-pipes	5,759	..	6,334

Proposals to Meet the Board's Deficiency.

The Special Committee appointed to consider the question of the existing large deficiency, and to offer suggestions as to the amendments to be sought in the Board's Acts, especially the Charges Act of 1907, have presented their report. The following are its salient features.

The Committee have examined the records of Parliament for the purpose of ascertaining the reasons which led to the adoption of the method of apportionment of any deficiency, which prescribes, not that the charge shall be levied upon the whole of the Board's area, but upon so much of it as is comprised in the borough and urban districts (including the City of London) as are, for the time being, entitled to be represented on the Board. By this method, the rural districts and the urban districts with no representation on the Board would escape a deficiency rate. It would appear from the records that the principle seems to have been that "the man who gets the benefit shall feel the burden, and that such burden accordingly should be distributed between the different authorities, not according to the rateable value of all the property in each district, but according to the rateable value of the premises supplied with water." In considering the matter, the Special Committee have been impressed by the advantage of retaining unimpaired the unlimited rating powers now possessed by the Board; such a course being, they say, a factor in maintaining the credit of the water stock. They have also been animated by a desire to avoid interference with the principle of apportionment adopted by Parliament. The Committee "believe that all these objects would be attained if the apportionment of the deficiency took place according to the revenue derived from each district, instead of the rateable value of the hereditaments supplied in each district." They suggest that the revenue upon which the apportionment is to take place should include that from non-domestic as well as domestic supplies, since the Board are under statutory obligation to supply for both domestic and non-domestic purposes. They do not propose any change in the immunity from the deficiency rate enjoyed under the Act of 1902 by the rural districts not represented on the Board. The Committee believe that, if their proposals are adopted, no alteration in the Charges Act of 1907 will be necessary at the present time. Their recommendation is that a Bill for submission to Parliament should be prepared to carry out their proposals.

The report came before the Board at their last meeting, when the adoption of the Committee's recommendation was moved by Mr. A. H. Tozer, the Chairman of the Finance Committee. In doing so, he pointed out that the deficiency had been growing during the last five years, and appeared likely to recur during the coming years if conditions remained approximately the same. Practically the whole of the Board's financial troubles were due to matters over which they had no control—huge increases in rates and taxes, increase in assessments on the Board's buildings, and the effect of the Finance Act on licensed property. It was therefore necessary to look to the future; and the Committee had come to the conclusion that they should seek power to levy the deficiency rate on a revenue basis rather than on the rateable value of the hereditaments. The Committee were practically unanimous in this recommendation. They were strongly of opinion that, under the present powers, litigation would follow any attempt to arrive at the rateable value of the hereditaments, and that the Board would be unwise in trying to arrange the matter on this basis.

Mr. Musgrave moved an amendment calling on the Finance Committee to issue precepts upon the constituent authorities, as provided by section 15 of the Metropolis Water Act, 1902. He said the proposals of the Committee at first sight appeared innocent; and so they were as to 75 per cent. of the revenue of the Board. But 25 per cent. of the total revenue was derived from the consumers by meter in manufacturing districts; and the effect would be to make them pay an undue proportion of the charge. The section which prescribed the method of levying the rate was clear; and he could not understand why the Finance Committee had for four years disregarded the obligation imposed upon them by the Act, and relieved the London ratepayer of a proper charge.

Sir Melvill Beachcroft said the deficiency rate had the captivating attraction that it would bring into payment those who enjoyed the protection of the water service but escaped payment altogether. Mr. Musgrave did not face the problem that a method which was considered too complicated to enforce had peculiar difficulties. Precepts, for instance, could not be issued for the whole £200,000 deficit; they would have to be issued for each representative year. This was inconvenient, and would mean that the Board would levy a 1d. rate one year, a ½d. rate another, and a ¼d. rate the next.

On a show of hands, the amendment was lost, and the Committee's recommendation adopted.

WATER FOR FIRE EXTINCTION IN LONDON.

Allocation of the Cost of Improvements.

At the Meeting of the Metropolitan Water Board last Tuesday, the Fire Brigade Committee presented a report on the subject of meeting the cost of improvements to be made in the arrangements for the supply of water for fire extinction. It was mentioned in the "JOURNAL" for July 9 (p. 138) that, after protracted negotiations and arbitration proceedings, it had been arranged that representatives of the Council and of the Metropolitan Water Board should meet, and endeavour to come to an arrangement on the basis indicated by the Arbitrator (Mr. Alexander Glen, K.C.). The Committee reported that the officials of the two bodies had arrived at a provisional agreement; and, having carefully considered the matter, they expressed the opinion that the proposed arrangements should be approved by the Council, as it was understood would be done by the Board. The terms were as follows; (1) In cases in which there does not appear to be any apparent benefit to the Board's undertaking, the Council shall pay the whole cost; (2) in cases in which there is an apparent benefit to the Board's undertaking, the Council and the Board shall pay the costs in equal proportions; and (3) in one case in which there is no apparent immediate benefit to the Board's undertaking, but in which there is a probable prospective benefit thereto, the Council shall pay three-quarters and the Board one-quarter of the cost. The list of works concerned, which was included in the report, contains twelve separate items, nine of which represent completed works, and the remaining three works which have not yet been commenced.

Taking the whole of the works, the total cost comes to £6789, of which £3878, or about 57 per cent., will be payable by the Council and £2911, or about 43 per cent., by the Board. In addition to the amount payable towards the cost of the works, certain expenses have been incurred in connection with the arbitration proceedings; and the Arbitrator's fees are payable in equal proportions by the Council and the Board. The total expenditure involved will probably not exceed £4200; and part of the cost of the works not yet commenced may not come into charge until after the current financial year. The Committee recommended that liability for part of the cost of certain extensions, connections, or improvements of water-mains be accepted by the Council, as soon as the Council have approved the necessary estimate and voted expenditure therefor; and that, as a matter of urgency, the special estimate of expenditure of £4200, submitted by the Finance Committee in respect of part of the cost of the works indicated, and in respect of expenses incurred in connection with the arbitration between the Council and the Board as to the allocation of the cost of the works, be approved, and the expenditure sanctioned. The recommendations were agreed to.

The Truro Gas Company have given notice of their intention to apply for a Provisional Order authorizing them to supply electricity in the city. Two other companies have also informed the City Council that they propose to make similar applications.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

Edinburgh.

At a meeting of the Edinburgh and District Water Trust held on Monday, it was resolved to adhere to the present water-rate as the basis of assessment for the forthcoming year. In the course of the annual financial statement, it was shown that the estimated expenditure for the current year was £180,227, against an actual expenditure last year of £179,672. The domestic rate would be kept at 10d. in the pound. The net capital expenditure of the Trust was £2,277,966, which included the Edinburgh Water Company's floating debt and the costs of the Act of 1869. The expenditure on account of the Talla Water-Works to date was £1,276,973. The total borrowing powers of the Trust were £2,530,000, of which amount £2,413,229 had already been raised. The collection of the water-rate last year was equal to 99·19 per cent. of the whole sum.

Beith.—At a meeting of the Beith Gaslight Company held on Monday, Mr. Andrew Smith was appointed Gas Collector, Clerk, and Treasurer, in succession to Miss Reid, who has resigned.

Broughty Ferry.—The inauguration function in connection with the installation of an automatic gas lighting system took place in the gas-works on Monday night. The system introduced is the first of the kind in Great Britain. The lights are switched on by an electric motor and fan, which measures the pressure to the necessary degree for lighting purposes, and is so devised that it is impossible to send into the town more pressure than is actually required for the lighting of the lamps. Mrs. Archer, the wife of the Lighting Convener, formally inaugurated the new system in the burgh by switching on the light. Messrs. Alder and Mackay, of Edinburgh, the Contractors for the work, entertained the company, who afterwards drove in motors round the town to view the effect of the new system.

Dumfries.—On Thursday, the Town Council fixed the price of gas for the current year at 2s. 7d. per 1000 cubic feet to ordinary consumers, and 3s. for prepayment meters—a reduction of 1d. in the case of the latter.

Falkirk.—A gas explosion occurred in Main Street, Camelon, Falkirk, on Wednesday night. There had been a leakage from some of the gas-pipes in the street, and the gas had found its way into the electric cable-ducts, and was escaping through one of the manholes in the pavement. Three men were standing close to the manhole, and one of them bent down to strike a match, and the light ignited the gas which was coming through the manhole cover. The result was an explosion, which blew the cover into the air. No other serious damage was done.

Kingskettle.—At a special meeting of the Parish Council, it was agreed to delay for a time the proposal to light the streets by gas, as there was a possibility of the Electric Power Company introducing light into the village.

Linlithgow.—The Linlithgow Coal Gas Light Company have reduced the price of gas from 2s. 10d. to 2s. 8d. per 1000 cubic feet.

Montrose.—With regard to the reference to the work done by Mr. Alexander Mackay at Montrose, which was made in a paragraph in the "Personal" column last week (p. 313), Mr. Mackay writes: "You give me credit for increasing the make of gas from 2,000,000 to 34,810,000 cubic feet. Though our progress has been satisfactory, I cannot claim quite so much. The progress has been from 27,000,000 to 34,810,000 cubic feet."

Wick.—The Directors of the Wick and Pulteneytown Gas Company have agreed to make a further reduction of 2½d. in the price of gas. In future, gas for lighting will be charged at 4s. 9d. per 1000 cubic feet, and for cooking and power purposes at 4s. 2d. This is the fifth reduction which has been made in the past five years.

Coke and Gas as Smoke Preventers.

The Medical Officer of Health for Woolwich, who was delegated to represent the Borough Council at the conference on smoke abatement held in London early in the year, has presented his report. He refers to the diminution of fog which has taken place, and attributes it to the greater use of gas, electricity, and coke instead of smoke-producing coal for domestic fires. He is not prepared to advocate the use of the closed stoves seen on the Continent; but he says very great improvement will be effected in the atmosphere of London when people leave off burning coal in wasteful fireplaces. He points out that gas-fires have the bright and attractive appearance of open fires, and also the advantage of coke as regards being smokeless. For bedrooms and for apartments only used for a short time they are more economical than coal. The same precautions must, however, be taken as with other means of heating—viz., the gas-fire should be connected with the chimney by a good flue. Referring to the objection raised to a gas-fire that it causes an unpleasant odour, he says there is no more from a gas-fire than from a coal-fire if there is an effective flue. Indeed, every coal-fire is also a gas-fire—the former being practically a combination of a coke-fire and a gas-stove, but one in which the fuel used is burnt in a wasteful manner. Summarizing the report, the Medical Officer says domestic fires are largely responsible for London smoke and the consequent fogs and gloominess of the atmosphere; but this may be prevented by burning coke and gas instead of coal, and by the use of the best modern type of economical open-fire grates.

Additional Capital for the Southend Water Company.—At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards offered for sale, by order of the Directors, £1500 of 4 per cent. perpetual debenture stock and an issue of new ordinary £10 shares in the Southend Water Company. The stock was placed at from par to £100 10s. per £100; and the shares, which rank for a maximum dividend of 5 per cent., but will carry 4½ per cent. on the completion of the purchase, were sold at par.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 2.

Sulphate of Ammonia.

There has continued to be a firm tone in the market during the past week, and all available supplies have found a ready outlet at full prices. The demand has, however, been mainly from dealers for the covering of previous contracts, and consumers generally are inclined to be somewhat apathetic. At the close, the nearest values are £14 3s. 9d. per ton f.o.b. Hull, £14 6s. 3d. per ton f.o.b. Liverpool, and £14 6s. 3d. per ton f.o.b. Leith. For future delivery, there is no change in the situation; and while, on the one hand, manufacturers still require a substantial premium for delivery late this year and early next year, on the other hand middlemen are reported to be selling over the same periods at about prompt values.

Nitrate of Soda.

There is no alteration in either the tone or the value of this material, and spot parcels are firmly held at 11s. per cwt. for 95 per cent. quality and 11s. 1½d. for 96 per cent.

LONDON, *Aug.* 3.

Tar Products.

Markets for tar products on the whole remain firm. There is not very much business to be done in pitch at the present moment. Though at some ports there is an inclination to do business at slightly lower prices, at other prices are still exceedingly firm. Benzols maintains their price; and there is a regular inquiry for prompt and forward delivery. Solvent naphthas are without alteration; and there is a fair inquiry for the forward position. In crude carbolic, some very high prices are reported to have been paid for near delivery. Creosote is firm, and business is exceedingly brisk.

The average values during the week were: Tar, 28s. 6d. to 32s. 6d. *ex* works. Pitch, London, 51s. 6d. to 52s.; east coast, 51s. 6d. to 52s.; west coast, Clyde 52s. to 53s., Manchester 50s. 6d. to 51s. 6d., Liverpool 51s. to 52s. Benzol, 90 per cent., naked, London, 1s.; North, 11½d. to 1s.; 50-90 per cent., naked, London, 10d. to 10½d.; North, 9½d. to 9⅝d. Toluol, naked, London, 10d. to 10½d.; North, 10d. Crude naphtha, in bulk, London, 5½d. to 5⅝d.; North, 4⅝d. to 5¼d. Solvent naphtha, naked, London, 1s. 1½d. to 1s. 2d. f.o.b.; North, 1s. to 1s. 1d. f.o.b. Heavy naphtha, naked, London, 11d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 3d. to 3⅛d.; North, salty, 2⅝d. to 3d.; liquid, 3d. to 3⅛d. Heavy oils, in bulk, 3⅛d. to 3⅜d. Carbolic acid, casks included, 60 per cent., east and west coast, 2s. 6d. to 2s. 7d. Naphthalene, £4 10s. to £10; salts, 45s. to 50s., bags included. Anthracene, "A" quality, 1¼d. to 1⅜d. per unit, packages included and delivered.

Sulphate of Ammonia.

There is little fresh to report concerning this article. The price remains fairly steady, and makers are unwilling to lower it for the forward position. Actual Beckton is still quoted at £14, outside London makes £13 7s. 6d. to £13 10s.; Hull, £14 5s.; Liverpool, £14 5s.; Leith, £14 5s. to £14 6s. 3d.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade has been active, and the production full, as usual before the holiday. In steam coals the prices have shown some advance. Best Northumbrians are from 14s. to 14s. 3d. per ton f.o.b.; second-class steams are about 12s., and smalls are from about 9s. to 10s. There are now heavy deliveries on contracts; and the production is well taken up. In the gas coal trade, best Durhams are from 13s. per ton f.o.b. Second-class kinds vary from about 12s. per ton; while for "Wear specials" the quotation is still 14s. As to contracts, others for British and foreign gas companies are in course of negotiation; the prices being very similar to those reported a week ago. In the case of one sale, to Genoa, a rather higher figure for delivery there is quoted; but this is because the sea freight is at present at a very stiff rate. For the coals, the price in such contracts varies from about 22s. 6d. per ton at Genoa; while those for the Commercial Gas Company, which are for delivery up to June, are from about 11s. 3d. to 12s. 3d. per ton f.o.b. in the Tyne. Coke is very firm. Good gas coke is from about 18s. to 19s. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

Throughout the various coalfields of Scotland an extra demand has been experienced during the week; and for export the available tonnage is inadequate. On Thursday, the f.o.b. prices quoted in Glasgow were: Steam coal, 11s. 6d. and 12s. per ton; splint, 12s. to 12s. 6d.; ell, 11s. 6d. to 12s.; trebles, 12s. 6d. to 12s. 9d.; doubles, 12s. 6d. to 12s. 9d.; and singles, 11s. 6d. to 12s.

London County Council and Meter Testing.—The London County Council, at their meeting last Tuesday, adopted the report of the Public Control Committee [see *ante*, p. 343], recommending an increase in the gas-meter testing staff and the provision of additional apparatus.

East Northumberland Water Scheme.—A large scheme of water supply, which it is proposed to carry out on a co-operative basis among local public authorities, is being developed in East Northumberland. The proposal is to form a Joint Water Board to secure parliamentary powers for utilizing water from the Simonside Hills, at Great Tosson, and from the River Alwin, a tributary to the Coquet. The total yield obtainable from these sources is estimated at nearly 4 million gallons per day. The whole scheme could, it is urged, be worked by gravitation; there being a fall of 10 feet per mile. A conference of representatives of public bodies, including those of Blyth, Bedlington, Ashington, Morpeth, and Pegswood, is to be convened to discuss the project.

Incandescent Gas-Burners for Working-Class Dwellings.—The London County Council, at their meeting last Tuesday, adopted the report of the Housing of the Working Classes Committee, referred to in the "JOURNAL" for the 30th ult. (p. 339), suggesting the substitution of inverted incandescent gas-burners for the flat-flame gas-burners at present in use for lighting the yards, staircases, and balconies of the Council's dwellings.

Municipal Coal Supply Question at Bradford.—A Sub-Committee of the Bradford Corporation, who have inquired into the question of establishing a municipal coal supply, have reported that the Corporation cannot buy coal cheaper than coal merchants, and that the profit does not average 1s. per ton on all coal sold by the merchants called as expert witnesses. The Sub-Committee are of opinion that it would be impossible for the Corporation to carry on the trade at a profit.

Birmingham Coal Contracts.—The Birmingham Gas Committee met on Monday last week to consider the placing of coal contracts for the year ending June 30, 1913. The prices tendered showed a considerable advance on last year; but, fortunately, the Committee had not to contract for the whole of the 600,000 tons required during the year. Last year they and their Secretary had the foresight to buy ahead about half the quantity of coal required for the current year; and the Committee placed contracts for the whole of the coal required.

Proposed Extensions at the Darwen Gas-Works.—In view of a proposed complete overhauling of the carbonizing plant at the Darwen Gas-Works, a Sub-Committee of the Gas Committee, with the Gas Engineer and Manager (Mr. A. H. Smith), have been visiting different places in England, and have also been to Munich, for the purpose of obtaining particulars as to the various systems of carbonizing, including vertical retorts and chamber settings. It is expected that their report will be presented shortly to the full Committee, and then to the Council with a recommendation as to the system to be adopted. When the project was first brought before the Gas Committee early in the year, the estimated cost of the alterations and extensions was given as about £20,000.

York Water Company.—The half-yearly ordinary meeting of this Company was held last Thursday. Alderman Sir Joseph Sykes Rymer (the Chairman) presided, and in moving the adoption of the report and account said they were very satisfactory. One very gratifying feature of the revenue account was the substantial increase in the income from water sold. As compared with the previous year, this amounted to nearly £500. Though this arose principally from trade supplies, they had an increase also in domestic consumption. They had delivered 511 million gallons of filtered water during the half year. The average consumption per head of the population worked out at 30·5 gallons—22·19 gallons for domestic and 8·34 gallons for business and public purposes. The motion was carried, and dividends were declared at the following rates per cent. per annum: Preference shares, 1876, at 5; ditto, 1896 and 1900, at 3½; ordinary shares at 10; and new shares, 1878 and 1879, at 7.

Darlington Gas and Water Undertakings.—At the monthly meeting of the Darlington Town Council last Thursday, Alderman Bartlett stated that the accounts of the gas undertaking showed an advance in all departments, and that there was an increase of £2107 in the net profit. The sum of £7000 had been promised in relief of rates—an increase of £1250; and £1412 had been carried to the reserve fund, being a rise of £857. Mr. W. E. Pease announced that the water undertaking had made a net profit of £8444, of which £7000 has been promised in relief of the rates.

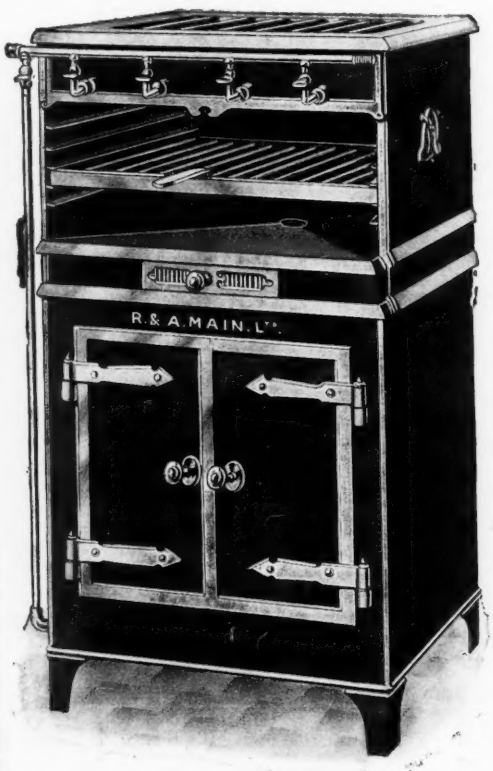
Artesian Wells in Gas-Works.—Some ten years ago, the Yeovil Gas Company had an artesian well bored 132 feet deep, from which the water overflowed at the surface, and a yield of more than 30,000 gallons a day was obtained. Latterly, however, owing to a number of other wells having been bored in the vicinity, the water-level lowered at certain hours of the day, during which time a reduction in the supply took place. To remedy this, a small compressed-air pumping plant has been installed by Messrs. Le Grand and Sutcliff, who originally bored the well; and the result is that a very copious supply can now be drawn at all times, regardless of the lowered head of water. Recently the Pinner Gas Company had bored by the same firm an artesian well, some 200 feet deep, the water from which is also drawn by a small compressed-air lift pumping plant, which raises a supply of upwards of 3000 gallons per hour, although, if required, the well is capable of yielding a much larger quantity.

The York United Gas Company were among the exhibitors at the Health Exhibition held in connection with the Royal Sanitary Institute Congress at York last week, and were awarded a silver medal for their gas cooking and heating apparatus.

At the meeting of the Ilkeston Town Council last Tuesday, it was mentioned that the Gas Committee had agreed to accept from the Royal Insurance Company the sum of £2000 as compensation on account of the disaster at the gas-works.

The Manchester Water Department reported, last Wednesday, that they had in the reservoirs 120 days' supply, compared with 56 days' supply at the corresponding period of last year. The consumption is also much below that of last year, owing to the recent heavy rain. For example, about 46,000,000 gallons were drawn off the reservoirs on the 30th ult., while on the same date last year the consumption was over 50,000,000 gallons.

At the Congress of the Royal Sanitary Institute held in York last week, some very conclusive statistics were given by Mr. A. J. Rushton, of the Leeds University, on the pollution of air by coal smoke. He estimated that the loss of fuel in the United Kingdom in the form of soot is 2,420,000 tons. That is to say, nearly 2½ million tons of soot annually escape into the air as the result of smoke pollution. Of this a certain amount falls, and a fraction of it sticks by virtue of the tar which it contains. The great bulk is blown away; polluting the atmosphere for miles round all the great manufacturing centres.



The "MAIN"
Gas Cooking Appliances.

Have you any enquiries for special Cooking Apparatus from the Hotels, Restaurants, Clubs, Bakeries, &c., in your district?

If so, send a note to us, and we will advise and quote you.

We have an unrivalled range of appliances to select from.

The illustration shows our No. 298 Combined Hot Closet, Toaster, and Boiling Stove.

R. & A. MAIN, LIMITED,

WORKS:

Gothic Works, EDMONTON, N.; Gothic Iron-Works, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES:

25, Princes St., Oxford Circus, W.; 136, Renfield St., GLASGOW; 56, Broad St., BIRMINGHAM; 83, Old Market St., BRISTOL; 13, Whitworth St. West, MANCHESTER; 8, Exchange Place, Donegall St., BELFAST; 333, Queen St., MELBOURNE; and 12, Cunningham Lane, Pitt St., SYDNEY.

Messrs. Krupka and Jacoby, the Agents for the United Kingdom for the "Graetzin" high-pressure gas-lamps, intimate that, owing to the growth of their business, they have purchased in Westminster a large property, consisting of offices, warehouse, and factory, built upon the latest and most up-to-date lines, and fitted with all modern improvements.

At the meeting of the Nuneaton Town Council last Wednesday, the Water Committee reported having considered tenders for the installation of pumping plant at the new Griff pumping-station, in order to complete the scheme already approved by the Council; and they recommended that the tender of Messrs. James Simpson and Co., of London and Newark, for £1897, be accepted. They also recommended the acceptance of the tender of the Stanton Iron-Works Company for about 200 tons of 9-inch pipes.

In the July number of "Advertising," Mr. R. L. Jameson had an article on "The Search for the Ideal Illuminant." His choice was narrowed down to gas and electricity; and he inspected some announcements in regard to these illuminants to ascertain if their avowed brilliancy would "bear the test of the public limelight, and uphold the integrity of the Press." The conclusion he came to was that the advertisements were so few and poor that he must trust to his limited technical knowledge of gas and electricity to aid him in his decision. He knew that neither of them would become quite extinct as the result of competitive advertising; but he was certain that "an expertly organized and administered advertising campaign would force either one to the top." Mr. Jameson advocates publicity, but does not believe in the technical expert as the agent. He considers that what is wanted is a man who can see, from the point of the view of the public, the advantages of the propositions laid down. The engineer will endeavour to force his own view-point, and fail. The public like an independent mind. Mr. Jameson cannot think of a field possessing greater possibilities than that of the supply of light and power. The more these are used, he says, the more indispensable they become. But he confesses that the entire range of advertisements before him would not tempt him to adopt either gas or electricity, if he did not know anything of them. If light and power advertisements were more stimulating, the public would, in his opinion, demand the advertised product, as they do in the case of others.

GAS COMPANIES' STOCK AND SHARE LIST.

The week just completed on the Stock Exchange felt the advent of the autumn recess, and particularly of the imminent August Bank Holiday, with its concomitant closure of the House on the preceding Saturday. Consequently, business drew in its horns as the week progressed, and was at no time more than moderate. Movements were often fitful and irregular in response to various moods—on the whole, adverse. The most cheering factor was the apparent dissolution of the strike campaign (after a sanguinary encounter), and a prospect of a peaceful solution to the resumption-of-work difficulty. On the opening day, the trend of things was rather hard to follow; but a good point anyhow was the firmness of the gilt-edged market, largely produced by the expectation of cheaper money, and Consols rose $\frac{3}{16}$. Railways made a fair start; but later on they gave way—many issues closing at a loss on the day. Americans were similarly affected. Tuesday's business was almost dead quiet, and the tone was not very pronounced. Gilt-edged things were mostly stronger, except Consols, which had a slight fall. Rails recovered on the collapse of the Transport Workers' Federation—a result at which the threatened Trades Unions may rejoice. On Wednesday, by way of a change, gilt-edged securities were about the best of the markets—low prices bringing in buyers at last; but Consols were doubtful, closing only at a small advance. Rails swayed about, rises and falls being practically on a balance. Foreign were firm. On Thursday, the tendency was rather adverse, owing, in a measure, to the trouble at the Docks. Government issues were weak, and Consols rather lower. Railways were quite flat—all prices going down. Americans, however, were buoyant, and made material advances. Foreign were firm and more active. Consols continued weak on Friday; but Rails, after a poor start, improved, and Americans maintained their strength. In the Money Market there was a fair demand, and rates were about steady. Business in the Gas Market was pretty fair in point of volume—the season and all other things considered; and the tendency was quite good, as indeed it might well be if the fortunes of the gas industry in general during the past half year may be estimated from the published accounts of companies already issued. In Gaslight and Coke, the ordinary continued the upward movement which was in full swing the week before, and—with transactions ranging from 104⅜ to 106¼—advanced its quotation by 1¼. All the secured issues had advances as well—the preference realizing from 99½ to 100, and the debenture from 74 to 75¾. South Metropolitan had only two bargains—at 118½; and the debenture made 77—a fall of ½. Commercial 4 per cent. changed hands at 108½. Among the Suburban and Provincial group, Bournemouth "B" made 16⅛, British debenture 92⅛, Brighton original 219, and South Suburban 122¼. In the Continental companies, Imperial marked from 175¼ to 178, and Continental Union 84½. Among the undertakings of the remoter world, Buenos Ayres realized 94, Primitiva from 7 5/16 to 7½, ditto preference 5¼ and 5⅜, San Paulo preference from 11⅞ to 12⅛, and ditto debenture 50.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	73—78	..	6 8 2
374,000	Stk.	July 12	4	Do. 4 p.c. Deb.	89—91	..	4 7 11
250,000	5	Apl. 12	7½	Bombay, Ltd.	6—6½	..	5 15 5
50,000	10	Feb. 29	15	Bourne- mouth Gas & Water } 10 p.c. B 7 p.c. Pref. 6 p.c.	16—16½	..	4 4 10
75,000	10	"	6		14½—14¾	..	4 1 4
380,000	Stk.	"	13½†	Brentford Consolidated	260—265	+2	5 1 11
330,000	"	"	10½†	Do. New	198—203	+2	5 3 5
60,000	"	"	5	Do. 5 p.c. Pref.	118—120	..	4 3 4
206,250	"	June 14	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
219,055	Stk.	Feb. 29	11	Brighton & Hove Orig.	215—220	..	5 0 0
244,300	"	"	8	Do. A Ord. Stk.	156—159	..	5 0 8
490,000	20	Mar. 28	12½	British	44½—45½	..	5 9 11
120,000	Stk.	June 28	4	Do. 4 p.c. Deb. Stk.	91—93	..	4 6 0
109,000	"	Feb. 15	6	Bromley, A 5 p.c.	130—135	..	4 8 11
165,700	"	"	4½	Do. B 3½ p.c.	100—103	..	4 7 5
82,378	"	"	5½	Do. C 5 p.c.	119—122	..	4 10 2
65,000	"	June 28	3½	Do. 3½ p.c. Deb.	78—80	..	4 7 6
250,000	Stk.	"	4	Buenos Ayres 4 p.c. Deb.	93—95	..	4 4 3
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	3½—4½	..	—
100,000	Stk.	June 28	4½	Do. 4½ p.c. Deb. Stk.	74—78	..	5 15 5
157,150	Stk.	Feb. 15	5	Chester 5 p.c. Ord.	110—112	..	4 9 3
1,513,280	Stk.	Feb. 29	5/9/4	Commercial 4 p.c. Stk.	108—110	..	4 19 4
660,000	"	"	5½	Do. 3½ p.c. do.	103—105	..	5 1 6
475,000	"	June 14	3	Do. 3 p.c. Deb. Stk.	73—75	..	4 0 0
800,000	Stk.	May 31	4	Continental Union, Ltd.	83—86	..	4 13 0
200,000	"	"	7	Do. 7 p.c. Pref.	133—135	..	5 3 8
492,270	Stk.	—	5½	Derby Con. Stk.	123—124	..	4 8 9
55,000	"	—	4	Do. Deb. Stk.	104—105	..	3 16 2
840,150	10	July 26	10	European, Ltd.	19—20*	..	5 0 0
16,160,600	Stk.	Feb. 15	4/17/4†	Gas- light & Coke } 4 p.c. Ord.	105—107	+1½	4 11 1
2,600,000	"	"	3½	3½ p.c. max.	83—85	+½	4 2 4
4,062,235	"	"	4	4 p.c. Con. Pref.	99—101	+½	3 19 3
4,531,705	"	June 14	3	Coke } 3 p.c. Con. Deb.	74—76	+1	3 18 11
258,740	Stk.	Mar. 14	5	Hastings & St. L. 3½ p.c.	93—95	..	5 5 3
82,500	"	"	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Apl. 26	11	Hongkong & China, Ltd.	16½—17	..	6 9 5
131,000	Stk.	Mar. 14	7½	Ilford A and C	155—158	..	4 14 11
65,780	"	"	6	Do. B	123—125	..	4 16 0
65,500	"	June 28	4	Do. 4 p.c. Deb.	91—93	..	4 6 0
4,940,000	Stk.	May 15	9	Imperial Continental	175—180	..	5 0 0
1,235,000	Stk.	Feb. 15	3½	Do. 3½ p.c. Deb. Red.	88—90	..	3 17 9
200,242	Stk.	Mar. 14	6	Lea Bridge Ord. 5 p.c.	125—129	..	4 13 0
561,000	Stk.	Feb. 29	10	Liverpool United A.	219—221	..	4 10 6
718,100	"	"	7	Do. B.	156—158	..	4 8 7
906,083	"	June 28	4	Do. Deb. Stk.	99—101	..	3 19 3
75,000	5	June 14	6	Malta & Mediterranean	4⅛—4½	..	6 3 1
560,000	100	Apl. 1	5	Met. of 5 p.c. Deb.	—	..	—
250,000	100	"	4½	Melbourne 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	May 31	3½	Monte Video, Ltd.	11½—11⅝	−⅛	6 0 5
1,775,892	Stk.	Feb. 15	4⅜	Newc'tle&G'tesh'd Con.	100—102	..	4 5 9
529,705	Stk.	June 28	3½	Do. 3½ p.c. Deb.	85—85½	..	4 1 10
55,940	10	Feb. 29	7/7/0	North Middlesex 7 p.c.	14—15	..	4 18 0
800,000	Stk.	May 15	8	Oriental, Ltd.	134—136	..	5 17 8
60,000	5	Mar. 14	8	Ottoman, Ltd.	7¼—7¾	..	5 3 3
31,800	53	Feb. 29	13	Portsea Island A	—	..	—
60,000	50	"	13	Do. B	130—133	..	4 17 9
100,000	50	"	12	Do. C	127—130	..	4 12 4
398,490	5	May 15	8	Primitiva Ord.	7⅛—7⅜	..	5 8 6
796,980	5	June 28	5	Do. 5 p.c. Pref.	5⅛—5⅜	..	4 13 0
488,900	100	June 1	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
312,650	Stk.	June 22	4	River Plate 4 p.c. Deb.	93—95	..	4 4 3
275,000	5	Apl. 12	12	San Paulo, Ltd.	13½—14⅛	..	4 2 9
150,000	10	"	6	Do. 6 p.c. Pref.	11⅞—12¼	..	4 18 0
125,000	50	July 1	5	Do. 5 p.c. Deb.	49—51	..	4 18 0
135,000	Stk.	Mar. 14	10	Sheffield A	234—236	..	4 4 9
209,984	"	"	10	Do. B	233—235	..	4 5 1
523,500	"	"	10	Do. C	233—235	..	4 5 1
90,000	10	May 31	7½	South African	8—9	..	8 6 8
6,429,895	Stk.	Feb. 15	5/9/4	South Met., 4 p.c. Ord.	117—119	..	4 11 9
1,895,445	"	July 12	3	Do. 3 p.c. Deb.	76—79	−½	3 15 11
209,820	Stk.	Feb. 29	8½	South Shields Con. Stk.	159—161	..	5 5 7
605,000	Stk.	Feb. 15	5/16/8	S'th Suburb'n Ord. 5 p.c.	122—124	..	4 14 0
60,000	"	"	5	Do. 5 p.c. Pref.	117—120	..	4 3 4
117,058	"	July 12	5	Do. 5 p.c. Deb. Stk.	120—122	..	4 2 0
502,310	Stk.	May 15	5	Southampton Ord.	105—107	..	4 13 6
120,000	Stk.	Feb. 15	7½†	Tottenham & A 5 p.c.	144—147	..	4 18 8
483,940	"	"	5½†	and B 3½ p.c.	116½—118½	..	4 17 0
149,470	"	June 28	4	Edmonton 4 p.c. Deb.	94—96	..	4 3 4
182,380	10	June 15	5	Tuscan, Ltd.	8½—8⅝	..	5 15 11
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	97—99	..	5 1 0
236,476	Stk.	Feb. 29	5	Tynemouth, 5 p.c. max.	113—114	..	4 7 9
255,636	Stk.	"	6⅞	Wands- worth B 3½ p.c. 3 p.c. Deb. Stk.	141—144	..	4 15 6
85,766	"	June 28	3		70—72	..	4 3 4

Prices Marked * are "Ex Div." † Next dividend will be at this rate.

Price 1s. 8vo., in Stiff Paper Cover.

THE EARLIEST WORKS ON GAS LIGHTING.

A List of Books, Pamphlets, and Important References Prior to the Year 1840.

By F. SOUTHWELL CRIPPS, Assoc.M.Inst.C.E.

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